DOCUMENT RESUME

ED 277 820 CE 045 747

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TITLE General Machinists Course Outline.
INSTITUTION Elk Grove Unified School District, Calif.
PUB DATE Sep 86
NOTE 207p.
PUB TYPE Guides - Classroom Use - Guides (For Teachers) (052)

EDRS PRICE MF01/PC09 Plus Postage.
DESCRIPTORS Adult Education; Behavioral Objectives; *Bilingual Education; Computers; Curriculum Guides; English (Second Language); Lesson Plans; *Machine Tools; *Machinists; Metals; Numerical Control; Postsecondary Education; Program Design; Safety; Second Language Instruction; *Trade and Industrial Education; *Vocabulary Development; Vocational Education; *Vocational English (Second Language)

ABSTRACT

This curriculum guide for a general machinists course is intended for use in a program combining vocational English as a second language (VESL) with bilingual vocational education. A description of the VESL program design appears first. The next section provides a format on developing lesson plans for teaching the technical and general vocational vocabulary contained in each job training lesson immediately after vocational lessons. Specific VESL teaching activities are provided for recognition, production, and application. Lesson plans for vocabulary development follow. Functions (objectives) are correlated to structures and vocabulary and required materials. The vocational training lesson plans are then presented. The format for each lesson plan is as follows: teaching materials source, main concepts, technical and related general vocabulary, teaching activity, material and notes, length of lesson, and evaluation. Lesson plans are divided into 10 units: shop safety, introduction to machine shop, metal, bench metal procedures, band sawing, drilling machines, engine lathe, milling machine, grinders and abrasive machining, and computer numerical control. Glossaries of technical and related general vocabulary follow each unit. Some glossaries are in English and Vietnamese. Tests follow unit 1. (YLB)

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GENERAL MACHINISTS COURSE OUTLINE

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September 1986

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
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GENERAL MACHINISTS

Course Outline

I. Shop Safety
   A. Safety Guide

II. Introduction To Machine Shop
   A. Basic Machines
   B. Shop Mathematics

III. Metal, The Study of
   A. Materials
   B. Selecting Metals

IV. Bench Metal Procedures
   A. Hand Tools

V. Bandsawing

VI. Drilling Machines
   A. Text Assignments
   B. Student Project #1
      Drill Grinding Gage

VII. Engine Lathe

VIII. Milling Machine

IX. Grinders and Abrasive Machining

X. Computer Numerical Control

VESL Curriculum Outline

A. VESL Program Design

B. Lesson Plan for Vocabulary Development

C. VESL Teaching Activities

1. Recognition Teaching Activities

   a. Repetition drill
   b. Substitution drill
   c. Variation drill

2. Production Teaching Activities

   a. Dialogue
   b. Speech
   c. Pair drill
   d. Communication grammar

3. Application Teaching Activities

   a. Total Physical Response
   b. Reading and writing using context clues

D. Specific work and Social Language Vocabulary from which specific structures may be chosen for each VESL lesson. (refer to number)

A. VESL PROGRAM DESIGN

In setting up our vocational-ESL courses, we chose a program that is generally considered the most effective vocational ESL disign. Our program combines VESL with bilingual vocational education. The students receive 3 hours a day of vocational training with a bilingual aide to explain difficult concepts in their own language. In addition to this course, there is a 3 hour job-related ESL course which consists of English for the vocational classroom and the workplace. Students who speak only limited English can begin vocational training immediately by receiving training in their own language and English for their future job. At the beginning of the course students receive heavy support in their own language to make certain they understand the basic concepts of the vocational course and to give them enough success to feel confidence. Gradually this support is taken away until the students are able to function almost exclusively in English. Regular meetings between the VESL and vocational instructor are essential to the success of this program.

The following techniques have been followed by our program:

1. Careful and in-depth planning
2. Careful needs assessment of job-market needs of the prospective trainees
3. A staff that is bilingual and committed to the success of the trainees
4. In-service training for staff
5. Personal and job counseling for the trainees
6. Full-time staff
7. Cross-cultural training in American culture, especially in American employment practices for trainees
8. Bilingual vocational instruction closely coordinated with the ESL instruction.
9. ESL instruction that is job-related and closely coordinated with vocational instruction
10. An advisory committee with representatives from minority community, the vocational skills area and the employment sector
11. Follow-up services for trainees who have completed the program and joined the work force. (Friedenberg p. 10)

The VESL curriculum of our BVT Program was drawn from a needs assessment of the classroom needs and the job world. During the first 3 months most of the time was spent on classroom subject matter because if the students couldn't understand what was happening in the classroom, it would be impossible for him/her to develop skills needed to survive in the job world.

After that, job getting, keeping and moving ahead skills were emphasized. In determining lesson content, the following steps are suggested:

1. Determine vocational topic, i.e. magnatism, electronic components, filling out application forms.
2. Determine the vocabulary, especially technical. Separate the vocabulary needed for recognition and from the vocabulary needed for speaking. Each category can be taught differently. REMEMBER, TEACH THE STUDENTS WHAT THEY WANT AND NEED TO KNOW.
3. Determine any grammar structures that need to be practiced for clear communication. Don't teach grammar rules for their own sake. If grammar is taught, teach it in a communicative way related to a vocational subject.
4. Determine the language functions needed for speaking.
5. Observe pronunciation problems that impede comprehension of message.
6. Determine the cultural behaviors that are different from American behavior because these differences may cause problems on the job site. Some of the problems that we learned about through our students were as follows:

   a. Not asking questions when they didn't understand.
   b. Bringing friends to the work site.
   c. Working during break.
   d. Relations with supervisors and American peeers.
   e. Isolating themselves from American workers.
   f. Interpreting a reprimand as a dismissal.
   g. Business decisions taken personally as rejection.
   h. "Cooperation" in tests or in work place where individual ability is necessary.

B. LESSON PLAN FOR VOCABULARY DEVELOPMENT

Each Job Training Lesson contains Technical and General Vocabulary. The following format is used to teach this vocabulary immediately after vocational lessons. The student demonstrates understanding (listening), speaking, reading, and writing skills using the technical and general vocabulary. For specific VESL teaching activities, see Recognition Teaching Activities, Production Teaching Activities, and Application Teaching Activities.

RECOGNITION

1. The teacher presents vocabulary (terms) clearly and slowly. Use actual equipment or tools whenever possible. Do not write vocabulary on board at this stage.
2. Students answer simple comprehension questions using yes-no response.

PRODUCTION

3. The teacher models key terms in a sentence to demonstrate how vocabulary is used. Ask students alternative or descriptive questions to elicit choice or descriptive answers.
4. Put students in pairs. S1 asks S2 using vocabulary, S2 answers. Reverse S2 asks, S1 answers.

APPLICATION

5. Write vocabulary (words) on board and explain again.
6. Have students read vocabulary list and do a reading-matching exercise.
7. Using context clues, have students fill in blanks using vocabulary.
8. Dictate vocabulary. Students write words. Check for comprehension.
9. Next day, give oral vocabulary test followed by written test.
10. Use total Physical Response Activities to check vocabulary comprehension and production.

C. VESL Teaching Activities

1. Recognition Teaching Activities

RECOGNITION TEACHING ACTIVITIES

DRILL FOR TEACHING SENTENCE STRUCTURE, VOCABULARY AND EVERY DAY LANGUAGE.

A. TEACHING REPETITION DRILLS

1. Model the item (word, phrase, or sentence) twice, having the students listen.
2. Model the item again, having students repeat chorally.
3. Model the item for each student as they repeat individually.
4. Model the item again as students repeat chorally.

If a student has difficulty, we backward build up. Have him/her begin from the end of the sentence and repeat increasingly longer segments of the sentence until the entire sentence is mastered.

EXAMPLE: I calibrate the volt meter.
meter.
volt meter.
the volt meter.
calibrate the volt meter.
I calibrate the volt meter.

B. TEACHING SUBSTITUTION DRILLS

1. Model the basic sentence twice, having the students repeat chorally.
2. Roll-play the substitution.
3. Drill the substitution individually.
4. Drill the substitution chorally again.

EXAMPLE: Go get the volt meter.
soldering iron.
screw driver
wires.

C. TEACHING VARIATION DRILLS

1. Teacher models item as phrase or sentence to have students generate different sentence patterns.
2. Students transform phrase or sentence items into questions. (interrogative sentences)
3. Students transform phrase or sentence items into commands. (imperative sentences)

EXAMPLE:

1. Teacher: Thanh calibrates the volt meter.

   S1 asks: Does Thanh calibrate the volt meter?

   S2 answers: Yes or no.

S1 asks: Who calibrates the volt meter?

S2 answers: Thanh does.

S1 asks: What does Thanh calibrate?

S2 answers: The volt meter.

2. Teacher: Le has the soldering iron.

S1 says to S2: Please get the soldering iron!

S2 says to S1: Solder the chips!

S1 says to S2: Be careful! Don't drop the soldering iron!

S2 says to S1: Watch out! The soldering iron is hot!

2. Production Teaching Activities

PRODUCTION TEACHING ACTIVITIES

A. TEACHING A DIALOGUE

A dialogue is a short conversation between at least two people. It is an excellent method for teaching everyday expressions and useful conversation. To be effective a dialogue should be lively, have fairly short sentences and useful language structure or expressions. Remember to make dialogues as true to life as possible. Use realistic props and actions. Students will remember words and expressions better if you use audio-visual and kinesthetic aids to help them learn. Also, remember to use hand signals to direct group participation. Always teach, beginning with large group, then small group and finally call on individuals when you feel certain they will succeed. (Mouth words).

Process for Teaching a Dialogue:

1. Give a brief introduction of the content of the dialogue. Improve your explanation by using audio-visual or kinestic aids as drawing pictures on the board or using gestures.
2. Act out or read through the dialogue dramatically.
3. Teach 2 lines at a time. Use gestures to help students learn.
   a. line 1 - teacher models twice alone, students repeat twice.
   b. line 2 - teacher models twice alone, students repeat twice.
   c. lines 1 & 2 acted out by teacher and students. Teacher is A and students are B. Exchange roles. One group is A, second group is B.
   d. Students practice lines 1 & 2 in pairs for a few minutes.
   e. Call on individuals to play parts in seat.
4. Learn lines 3 and 4, steps a-e.
5. Lines 1,2,3,4 acted out by teacher and students. Teacher is A and students are B. Reverse roles.
6. Students practice lines 1, 2, 3, 4 in pairs.
7. Seated role play.
8. Stand up rile play.

If at any time the students are having difficulty remembering their lines, you must provide supportive learning. Return to repetition part of learning until they are sure of themselves.

Alternate Method for Teaching Very Large Classes

Break large group into groups of 10. Chain drill instead of practicing in pairs.

EXAMPLE:

Bob: Hey Bao. Go get the drill and give it to me.
Bao: Excuse me. Please repeat that slowly.
Bob: I said, "Go get the drill and give it to me."
Bao: Now I understand. Thanks.

B. SPEECHES

To give students confidence in speaking English in front of a large group of people, students gave short speeches from time to time. Subjects ranged from topics of general interest to technical. Because of the students varying ability in English, a structured sample was prepared using the language experience method. The instructor often asked a series of sequential questions to the class. The answers given individually to students were put together into a concise paragraph that explained the subject. The paragraph explained the subject in the students' own language. It was used to teach stress, intonation, phrase reading, pronunciation and oral reading. The following day the lower ability students gave a speech on the same topic using any vocabulary and structure they liked from the class's model. The more advanced students gave a speech on the same topic but used their own language. The steps used are as follows:

1. Instructor asks a question.
2. One student answers it.
3. The instructor writes the answer on the board.
4. This procedure is followed until the paragraph is finished.
5. Instructor reads the paragraph to the class.
6. Stress is written in.
7. Students chorally repeat each sentence after the instructor. (two times)
8. Students read paragraph in pairs several times.
9. Several students read paragraphs individually to the class.
10. The following day students give speeches on the same topic.

Sample Lesson - How to Measure Current

Questions asked to individual students.
1) What is current?
2) What do you use to measure current?
3) What is the basic unit of current?
4) How do you measure current with an ampmeter?
5) What is the last thing you do?

PARAGRAPH WRITTEN COOPERATIVELY BY CLASS

Current is the flow of electrons through a conductor. An ammeter is used to measure current. The ampere is the basic unit of current. To measure current interrupt the circuit and connect the positive terminal of the ammeter to the positive terminal of the power source. Then you connect the negative terminal of the ammeter to the negative terminal of the power source. Read the scale of the meter to know how many amperes you have.

This is an excellent method to use with class when the instructor lacks knowledge about the topic. The instructor asks and students answer. Often argument over the correct answer takes place between students in English. The instructor does not have to feel totally expert in the subject matter.

C. PAIR WORK

The best way to improve English speaking ability is to give the students opportunities to speak. Due to the numbers of students in a class, it is difficult to give each student much individual time to practice. One of the best ways to overcome this problem is to devise speaking practice in pairs. The following example is a pair practice that combines the grammar lesson of count and non-count nouns with the subject matter of electronic components. Use any combination of vocabulary terms and simple grammatical structures.

EXAMPLE - Oral Practice (practice in pairs)

How much, many
a little, a few

QUESTION	ANSWER
How much _____ is required?	2 _____s are required.
How many _____ are required?	3
	Just a few.
	or
	Just a little ____ is required.
	A lot of

Fold your paper in half
You ask the question.

1. resistors - 2
2. electrons -3
3. switches - 5
4. resistance
5. time
6. watt - 7
7. power

You answer the question

1. resistors - 2
2. electrons - 3
3. switches - 5
4. resistance
5. time
6. watt - 7
7. power

8.	energy	8.	energy
9.	ampere - 10	9.	ampere - 10
10.	multimeter - 6	10.	multimeter - 6
11.	voltage	11.	voltage
12.	current	12.	current

D. COMMUNICATIVE GRAMMAR

You can further improve your students' listening and knowledge of correct verb tense by asking questions about the commands they have learned. Remember to model answers first so they will feel secure. The three kinds of questions you can ask are as follows:

1) Yes/no questions
2) Choice questions
3) Information questions

EXAMPLE

Command Go get the drill.

	QUESTION	ANSWER
Yes/no	Am I getting the pliers?	No, you are not.
Choice	Am I getting the pliers or the drill?	You're getting the drill.
Information	What am I getting?	You're getting the drill.

Bizarre questions will make them pay attention.

Am I getting the drill or taking a bath?

Verb tense

Examples for asking questions:

Simple present

Hai, put the soldering iron away.

Hai puts the soldering iron away everyday.

1. Does Hai put the soldering iron away everday?

   Yes, he does. or Yes, he puts it away everyday.

2. Does Hai put away the soldering iron or the PC board everyday?

3. Who puts away the soldering iron?

4. What does Hai put away?

3. Application Teaching Activities

A. TOTAL PHYSICAL RESPONSE

When you want a clear, direct methodology to teach your students to understand you when you give them commands or describe a process, use the Total Physical Response method (TPR). Students learn to understand and use vocabulary acting out commands and utilizing the senses of sight, hearing and touching. TPR is based on the theory that listening comes before speaking. Students must do a lot of listening before they easily recognize what they are hearing. Once they hear something with ease, they can repeat it.

The methodology also incorporates the idea that through the use of commands and simultaneous physical action, student learning is improved.

GENERAL TEACHING STEPS FOR VOCATIONAL TPR

1. Teacher models whole process 2 times.
2. Teacher models 3 commands at a time. (2 times) Use volunteers to model with you if you like.
3. Students respond to teacher commands with teacher as a model. (large group, small group, individual)
4. Students obey commands without the help of the teacher. (large, small, individual).
5. Students repeat the commands after you as you model action.
6. Teacher does the action and students give the command in chorus.
7. Teacher does the action, students give the command and teacher writes the command on the board. Students copy the commands.
8. Students repeat commands after instructor.
9. Students practice the commands in pairs.
10. Individual students give the commands to the class.

B. READING AND WRITING USING CONTEXT CLUES

Place the following words in the correct place.

hide	use	common sense
damaged	borrow	mistakes
obey	copy	injuries
workstation	report	run sweep
right place	clean	hoard
can you help me?	horseplay	accidents

1. Walk in the classroom. Don't _____.
2. No _____.
3. Keep your _____ in order.
4. Use your tools. Don't _____.

B. READING AND WRITING USING CONTEXT CLUES (continued)

5. Put your tools back in the _____. Look at the numbers.
6. Keep classroom _____.
7. _____ the room when it is dirty.
8. _____ Mr. Thompson's rules.
9. Don't _____ parts. Return what you can't _____.
10. When you don't understand Mr. Thompson, go to him or the aide and ask, "_____".
11. Do not _____ answers from other students. When you _____, you do not learn.
12. Report _____ and _____ to the instructor.
13. _____ _____ to the instructor. Don't hide.
14. Report _____ tools to the instructor. Don't _____ them.
15. The best rule is always use _____.

Function (The Student Can:____)	Structures & Vocabulary	Materials/Notes
Basic skills		
Recite the alphabet		
Count by 1's, 5's, 10's to 100, 1000		
Work Language		
multi-digit		
1.1 read numbers (handwriting, typeset, printout)	56135 = 56-135 or 5-6-1-3-5 or 56-13-5	parts, notes, printout forms
1.2 ask for clarification of poorly printed no's.	Can you help me. please? What's this number?	
1.3 read no's. arranged in rows/columns	The first number is_____ . The first number in the second row is_____. The last number in the third column is_____.	
1.4 count parts in containers	S1 How many do you have / are there in that___? S2 I have_____. There are___in this____.	bin, bucket, basket, bag, envelope

* Throughout this curriculum S1 refers to Speaker 1 for S2 to Speaker 2.

Function (The Student Can: ___)	Structures & Vocabulary	Materials/Notes
1.5 verify the count	S1 Check the count on these.	envelope with paper clips inside.
	S2 It's O.K. short/shy over	tags outside indicating number of parts
	S1 How many short/over?	
	S2 _____extra more short shy	
1.6 sign-off or bug-off on something	stamp/bug the card	stamp
	sign the card	
	initial the card	
	Would you please, _____	
1.7 sign-off in a specific location	stamp the card in the	
	upper/lower right/left	
	corner, in the middle/center	
	of the circle	

Function (The Student Can: ___)	Structures & Vocabulary	Materials/Notes
1.8 Indicate where something has been stamped off.	S1 Does it have a stamp/signature/initial S2 Yes in the _____.	cards as in 1.7 already stamped
1.9 Put things away	Put these {bins/envelopes/etc} on the top shelf. bottom shelf in the middle. middle shelf on the right. middle shelf on the left.	Shelves ...then ditto a hand-out to practice shelving.
1.10 Tell where things are	S1 Where are the bin? S2 On the top shelf etc.	
SOCIAL LANGUAGE		
1.11 Identify him/herself	S1 What is _____? What's your name? S2 My name is_____. Call me_____. How do you spell___?	discuss nicknames
1.12 Correct someones pronunciation/ spelling of his/her name.		
1.13 Identify his/her dept. & dept. no's.	I work in (name)_____. That's (number)_____.	

Functions (The Student Can: ___)	Structures & Vocabulary	Materials/Notes
1.14 Introduce him/herself	Hi! Hello! I'm_____. or My name is___ ____. I work in ___ ____.	
1.15 Introduce others in a room	This is _____. That is_____. Over there is_____. _____is over there. The woman on the right is_____. on the left in the middle *next to * behind * with the glasses in the blue sweater _____is on the right etc.	
1.16 Identify another person by describing physicial appearance.	S1 Do you know_____? Who is_____? Who's your supervisor? S2 ____is. Do you know her/him? No. What does s/he look like. S1 S/he is tall/short old/young about 30/40 thin/medium stocky pretty (adj) e.g. pretty tall, pretty thin kind of	. Milk and Honey, p.31-5 . Students describe other students . Pictures of leads, production managers, J. Beatty, Ron Beamer etc.

MORE NOTES: Additional Exercises

To expand Functions 1.1 - 1.10 ask students:

What are you doing?
What did you do?
(vary with she/he, etc.)

READING/WRITING: Ask students to read the information on their ID. cards, deleting names. Have other students guess which card goes with which classmate, from the descriptions. If no ID cards then do the exercise, have students write their own.

Function (The student can:___)	Structure & Vocabulary	Materials/Notes
BASIC SKILLS		
Identify colors and shades of colors.	brown, black, orange, red, yellow, violet/purple, gray/silver, white light/dark shin/dull or flat	Color wheel with spinner old new/coins as paint cards
WORK LANGUAGE		
2.1 Follow single step commands	bend-_____ insert twist_____ untwist hook_____ unhook wrap around straighten wind remove/take out coil uncoil tight loose right-side-up upside-down	wires pipe cleaners colored yarns/wools
2.2 Repeat instructions to indicate acknowledgement.	S1 Wrap the wire around the pen. S2 OK, Wrap it around the pen, like so / like this. / this way.	S1 Demonstrates action/ directions. S2 Performs action, repeating direction to indicate acknowledgemen

Function (the student can:___)	Structure & Vocabulary	Materials/Notes
2.3 Clarify directions in a process (brushing your teeth)	S1 Remove the cap. S2 cap ? S1 Yes, this is the cap. Squeeze the tube from the bottom. S2 Squeeze? What's that? S1 Yes, like this. Squeeze. S2 lay the toothpaste on the brush. S1 "Did make a mistake?" S2 "What's wrong?" S2 "What should I do now?"	toothbrush, toothpaste S1 should try to use some unusual terms to get S2 to clarify their meaning. Explain before hand that S2 is going to do this and that S1 should clarify and new words. At the end of the exercise review clarification techniques/question.
2.4 Repeat instructions to acknowledge them.	S2 Watch me do it now. S1 OK! S2 Remove the cap, like so. Squeeze the tube.	This function reviews 2.2. It also points to the fact that students can learn some language on the job by trying to use terms/expressions that native speakers have just used. Do this with one or two students to make this point. Then list out any vocab. students want to learn, let students pair-up & practice as an ESL operational drill.

Function (The student can:____)	Structure & Vocabulary	Materials/Notes
2.5 Follow color-linked directions.	S1 Bring me red wires. Bend one red one in half. Twist the ends together Wrap another red one around your finger. Insert the other red one into this hole. (To vary use 4 wires-add one of the other red ones.)	Photo board wires . Direct a student. Explain you'll say it once and that she'll have to clarify, slow you down or whatever. .Have students pair up and practice .Teach structures explicitly
2.6 Understand & respond to interruptions.	S1 What are you doing now? S2 I'm bending wires. winding etc. S1 How many are done? S2 ____. S1 Do that one, one more, after that one, then two more, stop. S2 All right.	S2 is given a bag of wires and is doing something to them. S1 is given a piece of paper telling how many wires are needed. S1 interrupts S2 and redirects her At the end, S1 shows S the paper.
2.7 Identify common tools.	S1 What's this? S2 It's____.	Emphasize pronunciation of tools used in assembly area. If possible get different types of some tool, e.g. a big/small tweezers (red hdle blk. hdle, needle nose).

Function (The student can: ___)	Structure & Vocabulary	Materials/Notes
2.8 Ask for/locate tools.	S1 Did anybody see my_____? use borrow S2 It's right there/over there on the shelf. S1 No. I have another one too. That's my small tweezer. I'm looking for the big one. or Thanks! That it's.	Ask student to leave room. Remove one tool. Let the class put it somewhere. Tell student to return.
SOCIAL LANGUAGE:		
2.9 Describe his/her daily routine.	Simply present tense. Include: drive, carpool or take the bus to work, arrive at work, work until, take a break, return to work, stop for lunch, go back to work.	
2.10 Ask and answer questions about daily work.	Frequency adverbs-every, always, usually, sometimes, seldom, rarely, never. Do you ever_____? Yes, _____. No, _____.	

MORE NOTES: Additional Exercises

- To give further practice to 2.3, 2.4 pick another operation using verbs,such as, squeeze, remove, lay, adverbs like gently, firmly (e.g. using a glue).
- To practice reading. Read bottle tops, packages for single-step instructions.

MORE NOTES: con't.

* To further practice 2.9, 2.10:

a. Draw a story square about two workers.

	starts work	goes home
Jan	6:30	3:00
Jane	6:45	3:15

practice: before earlier than
after later than

b. Role play - Your friend is thinking of coming to work at ELDEC. She has never never worked in a flex-time company. Explain what you usually do; how flex-time can be useful if you have an emergency or a late night party.

Let your friend clarify anything she doesn't understand.

c. Write and read work schedules.

d. Read an activity schedule from Echo Newsletter.

FUNCTION (The student can:___)	Structure & Vocabulary	Materials and No
BASIC SKILLS		
Calculate length of time		
Use/convert fractions to decimals	1/4, 1/2, 3/4 .25, .50, .75	
WORK LANGUAGE:		
3.1 Follow instructions for a new process. (Making a paper hat.)	1. Fold the paper in half with the edge up. 2. Fold the paper from left to right. 3. Unfold the paper, leave a line down the center. 4. Bring the top left corner to the center line. 5. Bring the top left corner to the center line. 6. Fold the bottom rectangular piece up. 7. Turn the hat over. 8. Fold the other bottom piece up. 9. Try on the hat to see if it fits.	paper squared off Instructor shows class one hat. Asks for a volunteer. Tells student she will both demonstrate and direct student in making hat. Student works alongside the instructor, clarifying, acknowledging terms.
3.2 Do a new process immediately after having had it demonstrated.	First then next What next? What now? Show me again.	Students try to make hats and talk their way through the process.
3.3 Read a simple diagram to do a process		orgami
3.4 Direct someone else using a diagram.		orgami

FUNCTION: (The student can:___)	Structures & Vocabulary	Materials/Notes
3.5 Follow a procedure to assemble something.	S1 1. Insert the end of the hose here. Rotate it clockwise until it locks. 2. Join the metal extension wands. Depress the locking buttons of one wand and push this into the other. 3. Push the assembled wands into the floor nozzle. Align the wand hole with the button on the floor nozzle. 4. Push the curved want into the straight wands. Aligh them.	Cannister vacuum
3.6 Follow a procedure for taking something apart.	5. Depress Detach/take off Counter clockwise pull out	Cannister vacuum
3.7 Seek and give confirmation that a task is completed	S1 Did you finish yet? S2 No, not yet. Two minutes. Yes, done. " /no, almost. S1 How much did you finish? do you have left? to go? S2 1/2, 3/4, etc.	
3.8 Report time needed to finish a task.	S1 When did you start? (3:00) When did you finish? (3:15) How long did it take? (15 minutes) Report it like this--(.25)	Oral/written problems
3.9 Talk about past events		Milk & Honey, P. 105-111

More Notes: Teaching activities

* To further practice assembly directions/terminology bring in examples of things that can be taken apart and put together e.g. ball point pens, flashlight

FUNCTION (The student can)	Structure and Vocabulary	Materials and Notes
Basic Skills		
*identify lines/points *identify parts/whole	parallel, perpendicular, point, diagonal, horizontal, vertical, curved, straight ----consists of----	Nucleus Unit 1 pages 1 - 2 letters of the alphabet
*identify common figures	square, rectangle, triangle, circle, semi-circle, angle	The letter A consists of 2 diagonal lines and a horizontal line. A square consists of----
4.1 Follow instructions for using a tool or instrument.	S1 We're going to do some measurements. Lay the _____scale flat against the line. Be sure that / Make sure that (using the right side.)	6" scale
4.2 Measure length, width, height, diameter.	S1 Measure the length etc. How long is the long/length? wide/width etc.?	10 objects to be measured
4.3 spot check work	S1 Check your neighbors work. Just check the first one, the last one and one in the middle. Then be sure to initial the ones you checked.	
4.4 report finished work	S2 Did you finish yet? Are you finished? Are you done?	Appoint a student to go around and check if others finished.
4.5 follow instructions for constructing lines and shapes of a specific size.	S1 Draw 3 lines. Make the first one 2" long and vertical. etc.	

FUNCTION (The student can)	Structure and Vocabulary	Materials and Note
4.6 Compare lengths, widths, diameters, gauge	longer, shorter, wider, narrower trace a line around a circle.	various lengths string, size pipe or tubes, guage wire
4.7 estimate the length/size of a line	S1 How long do you think this book is? S2 About _____.	
4.8 round off the size of something.	S1 Measure these lines. Tell me if they're precisely, exactly/ nearly, roughly the size stated.	worksheet. _____(1")
4.9 measure a space or a gap	S1 Measure the gap between these two lines.	_____ _____ gap
SOCIAL LANGUAGE		
4.10 Describes a past event at ELDEC	S2 Did you hear about_____? S1 No what happened? S2 She found out she was allergic to flux. S1 What? What do you mean? How did she find out? S2 She notices her skin was always red. So she went to the doctor. He told her to rub some of the things she was uses at work on a band-aid, one by one. Then to put the band-aid on her arm, and to pay attention to the reaction. S1 And? S2 She tried a few things. Flux turned her skin red. S1 So what's she going to do? S2 She told her lead and supervisor. They just assigned her other jobs. S1 That's nice.	Ask comprehension questions. Try to get students to talk about past experiences that happened to them.

MORE NOTES AND ACTIVITIES:

* Try to write up the last dialogue as a small group story.

  Read it. Ask Questions.

  Develop it into a strip story.

FUNCTION (The student can)	Structure and Vocabulary	Materials and Notes
Basic Skills		
*identify objects	bell shaped, star shaped, wedge shaped	Nucleus
Work Langage		
5.1 follow directions to assemble something	Key Terms insert press hard Hold the rattle firmly. Slip a dics over. Let it rotate freely. Test it by sliding the discs back and forth and by spinning them.	Tinker toys Have one student leave the room. Make a rattle. Let the classmates think of directions. When directions are complete invite the student back. Let the class direct her. She should clarify/confirm instructions and make the rattle
5.2 follow assembly directions	Key terms Rock it gently.	Tinker toy balance bird.
5.3 describe an assembled object.	It has consists of ___	balance and rattle
5.4 describe common classroom objects in terms of physical appearance.		
5.5 Take apart assembled objects.		
5.6 Build something with common shapes.		Wood blocks, place two students back to back. Let them practice clarifying, confirming info.
5.7 Identify differences	I put_____ She put_____ This should_____	Students describe differences in structures. Look for reversed, not centered, wrong size.
5.8 Report finished work	S2 Have you finished yet? S1 Yes, I have. No, I haven't. S2 How far have you gotten? S1 Half done. Two-thirds done.	Contrast: Did you? Have you?

UNIT -

FUNCTION (The student can)	Structure and Vocabulary	Materials and Notes
Social Language		
5.9 Discuss life in	S1 How long have you lived in Seattle? Did you live in another part of the states before? Where do you live now? How long have you lived there?	
	S1 Have you ever seen _____? eaten at _____? gone to _____? tried _____?	
	S1 Yes, I have once twice a few times.	
	Have you? No, I haven't. What is it?	

Further Notes and Teaching Activities:

* To further practice social language and reading bring in example announcements. From cafeteria notice board e.g. (garage sale, Kingdome nite etc.).

FUNCTI (The student can)	Structure an ocabulary	Materials and N
Basic Skills		
* recognize sequences and pattern	every other one alternating every third one fourth etc	Letter sequences aB cD a b c D etc
Work Language		
6.1 Identify differences	S1 They're the same/different There's a line missing. an extra line. The line isn't routed the same. The line doesn't connect the same points.	Prince/Gage Worksheets Students compare model to samples describe the differences
6.2 Direct someone to -- Correct something	**Key terms** Remove Replace Connect Add Reroute	
6.3 Make modifications in something.	S2 Write the alphabet using capital and small print. Make every other letter capital. S1 ..... S2 Hold it. Change that. Make it all capital.	Discuss revisions, changes, modifications.
6.4 Measure lines (revised exercise)	S2 Draw a 3" line. Use this ruler Pay attention to the ruler. It is a space. Line up the ruler from this point on. S2 Draw a 6" line now. Hold it. Change that to 4 1/2".	plastic rulers Ask class what revision has been made in this exercise. Ask what revision has been made. Practice directing, interrupting revising. We extend, shorten-lengthen.

UNIT 6

FUNCTION (The student can)	Structure and Vocabulary	Materials and Notes
6.5 Discuss factors in terms of enough/too much	enough/too much sufficient, insufficient excessive	Nucleus, p. 60-64
Social Language		
6.6 Comment on an important personal occasion	Formula for congratulating or condoning Cue: Mary's child is sick. S1 Is that so? I'm sorry to hear that. Cue: Sue's getting married. Is that right? Congratulations on the wedding! Will she have an engagement party?	Cue's for birth, death, illness, retirement, layoff, graduation, accident.
6.7 Comment on objects	S1 Is that a new_____?	picutres, cars, hairdos, clothes

Further Notes, Activities

To extend 6.6, 6.7 bring in potpourri readings from Echo. Role play comments.

FUNCTION (The student can)	Structure and Vocabulary	Materials and Hot
Basic Skill		
Work Language		
7.1 Ask for help explain how to operate, use a piece of equipment	a. S1 Can you show how to use this? S2 Sure. First, _____.	wire stripper wire check to see if student uses, Insert, check to be sure, release, etc.
	b. -plug in recorder -push the eject button to open the recorder. -insert a casette and close the cover. -push/depress fast forward to advance the tape. -push the rewind button to rewind -push the play button to listen to the tape -push the play and record buttons together/simultaneously to record. -push the stop/eject button to eject or release the tape.	Casette player
7.2 explain why something was done	S1 Why did you_____? S2 In order to _____to _____. So that_____.	Refer to 7.1

FUNCTION (The student can)	Structure and Vocabulary	Materials and Notes
7.3 call attention to a malfunction/problem	S1 Can you help me? take a look at this. come here. S2 What's the matter? problem? S1 I think there's something wrong with this lighter. It must be broken. S2 How do you know? What's it doing? S1 The flame is too high. S2 I see. Have you adjusted the set screw? S1 Oh! No. I haven't. Maybe that's it. How do you do that? S2 Let me show you. Just turn this until the flame goes down. S1 I see thanks. (revise for no flame/add fluid, too low adjust).	Zippo lighter Demonstrate the lighter. Tell the class you're going to read a conversation about it. Ask questions. Then let students practice.
b.	S1 This scale must be broken. S2 Why? S1 I should be 138 lbs. This says 145 lbs. S2 I see. Have you looked at the zero set. S1 No I haven't. S2 Get off. Let me see. It's 7 lbs. off. Turn it back.	scale

UNIT 7

FUNCTION (...e student can)	Structure and Vo...bulary	Materials and Notes
Social Language		
7.4 Greet another worker: Comment on appearance	S1 You look tired. S2 I am. My child was sick all night. I came to work an hour later than usual. S1 Go to sleep early tonight. Get some rest. Two days later..... S1 You still look beat. S2 Every other day something else happens. My kid was sick again. I'm beat! S1 Lucky thing we've got flex time.	Read and ask questions. Then act out.
7.5 Comment on important personal occasion	Formula for congratulating or condoning Cue: Sue's child is sick. S: Is that so? I'm sorry to hear that. Is it serious? Cue: Joan's getting married. S: Is that right? Congratulations on the wedding. When's the engagement?	Cue for birth, deaths, illness, birthday, retirement, layoffs, graduation
7.6 Comment on objects	S1 Is that a new_____? S2 Yes. It is. No. I've worn it before. had it a while. S1 Is that right/so? It's nice. I like it. It looks new.	pictures of cars, hairdos, clothes, etc.

More I es: Teaching Activities

- Potpourri stories in Echo are a resource for reading and gathering role play reactions.
- The Birthday
  Strip-o-grams, balloon-o-grams and other services are more and more common in-company for birthday parties. Ads from The Weekly and stories in there might be appropriate/funny stories for reading/discussion.

- Alarm clock
  A story about a worker who forgot to adjust/set her clock for daylight savings, or standard time is another reading topic. This could then be converted to a dialogue/role play.

FUNCTION (The student can:___)	Structure and Vocabulary	Materials and Notes
WORK LANGUAGE		
8.1 Understand conditional statements	S1 Verify the count on these. If its short indicate. So is the 3rd box. If its over, mark the 2nd box. If its ok, check the 1st box.	clips, envelopes
8.2 Explain to someone how to operate a machine with many variables. (a car)		Prince/Gage Consumer material--a car (role play)
8.3 Explain bureaucratic procedure/police	S1 What do you have to do to get a driver's license? S2 You have to fill out an application. " " take an eye test. " " pay an application fee. " " show proof of age. " " take a written test. " " take a driving test.	Milk & Honey get a car loan open a savings account
8.4 make a suggestion		Milk & Honey, p. 180

FUNCTION (The student can:___)	Structure & Vocabulary	Materials/Notes
9.1 Make Suggestions		Values clarifications
9.2 Prioritize, rank items		Values clarifications
9.2 measure his/her own values and compare to American values, and his/hers cultures values.		Cultural awareness resource guide
9.3 Describe review policy		

Notes & Teaching Activities

* Read a blank performance review form. Let students self-evaluate. Let students consider form in light of American values.

* Read Echo on Safety (Feb. '83) Develop an activity for giving suggestions.

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 1

Teaching Materials Source Safety Guide
Chapter Personal Safety and General Safety Practices - pages 2 thru 5
Lab Manual pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
The importance of his/her personal safety as related to machine shop activities.	see Glossary	see Glossary	Through lecture and demonstration with realia.
Fire prevention		2.1	
Finishing Room		2.3	
Shop Practices			

Materials and Notes

1. Sound Film Strips
2. Hand out materials

Length of Lesson	Evaluation
1/2 hour	Written Test

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 2

Teaching Materials Source Safety Guide
Chapter Hand Tool Safety Practices
pages 11 through 13
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Safety practices dealing with hand tools used in the machine shop.	see Glossary	see Glossary 2.7 2.8	same

Materials and Notes

Same

Length of Lesson	Evaluation
1/2 hour	Written Test

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAIN[illegible] LESSON PLAN # 3

Teaching Materials Source Safety Guide
Chapter Crucible Furnace
pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Safety practices dealing with pouring molten metal. (Foundry)	see Glossary	see Glossary 3.1	Demonstration and Lecture.

Materials and Notes

Foundry Equipment

Length of Lesson	Evaluation
1/2 hour	Written Test

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAINING LESSON PLAN # 4

Teaching Materials Source Safety Guide

Chapter Pedistal and Bench Grinder

pages

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate the Pedistal and Bench Grinders safely.	see Glossary	see Glossary	Demonstration and Lecture.

Materials and Notes

Bench and Pedistal Grinders

Sound film strip

Projector

Length of Lesson

20 minutes

Evaluation

Written Test

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAIN[illegible] LESSON PLAN # 5

Teaching Materials Source Safety Guide
Chapter Vertical Bandsaw and Horizontal Bandsaw
pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate the Vertical and Horizontal Bandsaws safely.	see Glossary	see Glossary 4.2	Demonstration and lecture

Materials and Notes

Horizontal Bandsaw
Vertical Bandsaw

Length of Lesson	Evaluation
1/2 hur	Written Test

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAIN[illegible] LESSON PLAN # 6

Teaching Materials Source SAFETY GUIDE
Chapter Drill Press
pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate a drill press safely.	Drill Press Center-punch The feed pressure Revolving spindle Chuck hot chips	Thin metal Chuck key	Demonstration and Lecture.

4.6

Materials and Notes

Drill press and accessories

Length of Lesson	Evaluation
20 minutes	written test

77

78

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAI[illegible] LESSON PLAN # 7

Teaching Materials Source SAFETY GUIDE

Chapter Metal Turning Lathe

pages

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate the metal-working lathe safely.	see Glossary	see Glossary 4.9 5.1	Demonstration and Lecture

Materials and Notes

Metalworking Lathe and Accessories
Sound Film Strips
Projector

Length of Lesson

1/2 hour

Evaluation

Written Test

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAINEE'S LESSON PLAN # 8

Teaching Materials Source SAFETY GUIDE

Chapter Metal Shaper and Vertical and Horizontal Milling Machine

pages

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate the metal shaper, horazontal and vertical milling machines safely.	see Glossary	see Glossary 6.2	Demonstration and Lecture.

Materials and Notes

Metal Shaper and Accessories

Length of Lesson	Evaluation
1/2 hour	Written Test

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAIN[illegible] LESSON PLAN # 9

Teaching Materials Source SAFETY GUIDE

Chapter Arbor Press, Punch and Die Press

pages

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
How to operate the Arbor press and punch and die press safely.	Arbor Press Punch & Die Press	seated are mated 5.6	Demonstration and Lecture.

Materials and Notes

Arbor Press

Punch and Die Press

Length of Lesson	Evaluation
1/4 hour	Written Test Skills Test

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Personal and General Safety Practices

Occupational Safety and Health Act
Appropriate safety attitudes and judgments
Safety consciousness
Discriminate
Worthwhile
undesirable
Risks and act accordingly
Self-discipline
With authority
Cope with
Obvious
Presumed hazards
Be assured
The basic fundamentals
Accident prevention
Public tax money
Conserved
Effective accident prevention programming
Safety instruction
Exhibit behavior pattern conductive to
Tools
Machines
Materials
Shop cleanup
Safety practice
Power cord
pointed tools
machinery
equipment
electrical switches
plugs
outlets goggles
Face shields
Compressed air
Chips

Shavings
Pressure-operated equipment
Extinguishers
Combustible Materials
Flammable liquids
CO2 or Dry powder
Metal or metal alloy
Exhaust fan
Respirator
Sparks
Spray booth
Power machine
Plugging
Portable electric tool
Loose knots
Nails
Paint
Safety zones
Rotating machinery
Tight fitting cap
Ventilation systems

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Hand Tool Safety Practices

Hand tool
In good condition
The cutting edge
In a vise
The vise jaw
chips
Shavings
Scraps
Machined
Tempered
Hardened surfaces
Soft-faced hammer
Rawhide
Lead
Copper
"Mushroomed" head
The butt
Chisels
Punches
Screwdrivers
Electrical Equipment
Prybars
An insulated handle
Pliers
Files
Saws (Hack)
Hack saw blade
2 teeth cutting
Wrenches and Pliers
Adjustable wrenches
Movable Jaw
The stationary jaw
The bolt or nut
Moving machinery
Awls and Scribes

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Crucible Furnace

Furnace
Crucible
Castings
Foundry
Molten metal
The skimmer
HOT METAL
Safety zone
The mold
The parting line
Flux
Pyrometer
Slag
Skimmed off

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Pedistal and Bench Grinder

Pedistal
Bench Grinder
Safety glasses
The wheel
Full operating speed
Applying work
The tool rest
The shaft
The spindle

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Vertical and Horizontal Bandsaw

Upper guide
Stock
Miter guage
Back-up block
To a jig
Relief cuts
The band saw
A coasting band saw
A gauge tension adjustment
Low-toned musical ring
Thud

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Metal Turning Lathe

metal turning lathe
shop coat
tool post
polishing your work
chuck jaws
tailstock
springy work
a lathe chuck
the chuck socket
a chuck board
the thread
faceplate
the power feed
tool bit
shoulder
the hand feeds
outer end of
us a cleaning brush

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Metal Shaper & Vertical and Horizontal Milling Machine

Metal Shaper
lead or brass hammer
the proper tool bit
the machine adjustments and limitations
the ram and head
handwheel
magnetic chuck
Milling Machines
The correct cutter arbor
setup
the main clutch
the cutter rotation
the rapid traverse feed

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Personal and General Safety practices

Proper use
Responsibility
Distract
Injury
Disconnect
Objects
Eye protection
Designated container
Smothering
Immediately
To designated area
Empty spray cans
Fumes
Rags
The operator
Foreign material
Defective blade
Safety rules
Emergency
Obscure
The vision
A fire drill
Other disaster
Established school procedures

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Hand Tool Safety Practices

Projecting
Clamp
Increase the pressure
Cracks or splinters
Attached to
Grip it
Normal swing
The twist
Properly secured to
Prevent slipping
Brittle
Shatter
Well-balanced position
40 strokes
Leverage
Fit snugly
Irregularly-shaped objects

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Crucible Furnace

Flammable material
Prescribed procedures
A Crucible containing
Under no circumstances
Ladles
Crucibles
Accidental burns
Designated
Floating
Releasing
Temperature
Disposed of
Ingots

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Pedistal and Bench Grinder

Grooves
Work should be fed
Prior to
Adjust
In motion
Avoid grooving
Chatters or vibrates excessively
Balanced
In contact with
Permission

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Vertical and Horizontal Bandsaw

Radius of the cut
Width
Curved cut
Reset
Determine
Proper blade
Tapped
Ample coolant
Protruding end
Burrs on

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Metal Turning Lathe

Dress appropriately
Raxor sharp
abrasive cloth

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Metal Shaper & Vertical and Horizontal Milling Machine

The parallels
device
manually
a complete cycle of operation
stand off
the line of travel
be disengaged

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Using Mathematics

Historical Background of Geometry
lines, angles and triangles
metron
surveying
navigation
astronomy
practical occupations
logical reasons
relationships
culminated
undefined terms
point, line and surface
underlie
represented
dot
locality
designated
intersect
otherwise
illustrating
projection screen
stretched thread
segments
midpoint
bisect
closed curve
symbol
circumference
radius
chord
diameter
arc
semicircle
entral angle
equal circles
vertex
protractor
Navy Compass
acute angle
right angle
obtuse angle
straight angle
reflex angle
additional angle facts
equal angles
perpendiculars
perpendicular bisector
rotation
are associated with
minor arc
intercept
chord
secant
tangent
inscribed polygon
quadrilateral
circumscribed circle
circumscribed polygon
inscribed circle
concentric circles
converse
radii
equal arcs
Alphabet of Lines
blueprint reader
interpretation
visualize
feature
dahes
alternately
freehand
zig-zag
phantom
projection
nonreproducible
aides
drafter
adjacent
ditto
extension lines
dimension lines
centerlines
arrowhead
symmetrical parts
leader lines
projection lines
inclined line
tolerances
fractional
PLC decimal
Orthographic Projection
visualize
standardized signs and symbols
drawing interpretation
relationship
mentally
principals of projection
transparent sides
hinged
traced
complexity

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Using Mathematics

activities
engaged
dwellers
crude
fashion
base
uniform
Magna Charta
tremendous
standardizing
iron ulna
constancy
permanence
adopted metric system
meter
volume
litre
preferred
North pole
Equator
linear systems
decimeters
dekameter
hectometer
survived
millimeters
centimeters
meters
kilometers
provision
derived
cubic decimeter
kilogram
convert
proposals
mandatory
resulted in
technology
feature
customary
convert
a pile of
raw material
prefixes
subdivision
backbone
technological economy
specialization
reconciled
visualize
dual dimensioning
eliminates
conversion unit
installed
installed
parentheses
minimum
maximum
digits
bilateral tolerance
adjacent
abbreviation
roundoff
photographic
regardless of
painstakingly
analyze
microscope
spectroscope
suitable
inherent
graduated
various combinations

INTRODUCTION TO SHOP SAFETY

SAFETY TEST

DIRECTIONS: In each of the statements below, one of the answers is correct. Place the number of the most correct answer in the corresponding blank on the answer sheet.

A. PERSONAL PRACTICES:

1. The habits of care and caution which students develop through safe practices protects
   (1) themselves (3) some students
   (2) everyone (4) the instructor

2. Cleanup is the responsibility of
   (1) each student (3) the instructor
   (2) the foreman (4) the custodian

3. When in doubt about any job or operation, you must ask
   (1) the principal (3) the foreman
   (2) another student (4) the instructor

4. Caution another student if you see a violation of
   (1) good manners (3) safety practices
   (2) proper grammar (4) proper posture

5. When using hand tools or machines, give the job at hand
   (1) all your attention (3) most of your attention
   (2) some of your attention (4) little of your attention

6. In case of injury, report at once to the
   (1) nurse (3) class
   (2) instructor (4) doctor

7. When working with hand or power tools, all loose clothing and loose jewelry must be
   (1) left on (3) removed
   (2) hidden (4) adjusted

8. Whenever possible, the motion involved in striking objects or cutting materials is
   (1) towards yourself (3) downwards
   (2) away from yourself (4) upwards

9. Do not carry sharp or pointed tools or materials in your clothing. Hold sharp points or edges
   (1). down
   (2) out
   (3) up
   (4) in the hand

10. Disturbing another student while he is working is
   (1) helpful
   (2) poor manners
   (3). dangerous practice
   (4) the quickes way to do a job

11. Any dangerous condition in the shop must be reported to the instructor
   (1) when convenient
   (2). at once
   (3) at the close of class
   (4) after school

12. Lifting heavy objects can cause injury to the student. If too heavy,
   (1). get help
   (2) lift anyway
   (3) call the custodian
   (4) call the nurse

13. Before touching electrical switches, plugs, or receptacles, one should
   (1) ask the foreman
   (2). have dry hands
   (3) turn off the main power
   (4) obtain help

14. Horseplay is
   (1) sometimes permitted in a shop
   (2) often permitted in a shop
   (3). never permitted in a shop
   (4) seldom permitted in a shop

15. Eye protection must be worn
   (1) whenever you are using a machine
   (2) whenever someone at your table is using a tool
   (3). at all times
   (4) whenever you are using a tool or machine

16. Becuase of the extreme danger, a stream of compressed air must never come in contact with
   (1) your eyes
   (2) put in a fire
   (3) face
   (4). your body

17. Nails, tacks, and other nondigestible materials are never to be
   (1) put in your pocket
   (2) put in a shop apron
   (3). placed in your mouth
   (4) placed in a jar

B. <u>FIRE PREVENTION</u>:

18. All students should know the location of
   (1) the restrooms
   (2) the admin. building
   (3). fire extinguishers
   (4) the drinking fountain

19. Fine sanding dust should be deposited in proper containers because it is
(1) messy
(2) explosive
(3) makes you sneeze
(4) hard to sweep

20. The type of extinguisher to be used on class "A" fires such as wood is
(1) CO2
(2) soda-acid
(3) dry powder
(4) all of these

21. Fires involving electrical equipment should be extinguished with
(1) soda and acid
(2) water
(3) dry powder or CO2
(4) sand

22. In case of fire
(1) yell
(2) notify the instructor
(3) run
(4) forget it

C. FINISH ROOM:

23. A spray gun operator must wear
(1) a face shield
(2) loose clothing
(3) head gear
(4) a mask or respirator

24. Rags containing oil, gasoline, paint, solvents, or other combustibles should be placed
(1) outside
(2) in ventilated containers
(3) in designated and approved containers
(4) saved and washed

25. Chemical cleanine solutions should not come in contact with
(1) painted surfaces
(2) plastic surfaces
(3) clothing
(4) skin and eyes

D. SHOP PRACTICE:

26. Machines may be operated only by a student who has had instruction and received permission from the
(1) foreman
(2) principal
(3) another student
(4) instructor

27. Guards and other safety devices are for your protection. Always
(1) remove them
(2) cover them
(3) keep them in place
(4) move them out of the way

28. The main power switch may be turned on only by
(1) the shop foreman
(2) the person who has permission to use a machine
(3) anyone who knows how to do it
(4) the instructor

29. In the working area around a machine ther should be only
(1) the operator and the next person to use the machine
(2) the operator and shop foreman
(3) the operator and the instructor
(4) the operator and the cleanup crew

30. If equipment does not work properly, shut off the machine and inform the
(1) foreman
(2) instructor
(3) custodian
(4) principal

31. Spilled oil or grease is dangerous. Always
(1) clean it up at once
(2) leave it
(3) pour water on it
(4) sprinkle gasoline on it

32. All floors, aisles, and passageways are to be clear of
(1) stock
(2) stock, tools, and materials
(3) tools only
(4) materials only

33. Students should operate machines only when
(1) they have passed the safety test and received instruction
(2) the instructor is in the shop
(3) supervised by the foreman
(4) other machines are not operating

34. Before plugging in the line cord of any portable electric tool, check to see that the
(1) switch is on
(2) tool is new
(3) switch is off
(4) tool is dirty

35. All adjustments on power tools must be made when
(1) power is off
(2) needed
(3) machine is coasting
(4) you feel like it

36. When creating harmful dusts, mists or vapors make sure you
(1) call the nurse
(2) turn on proper exhaust or ventilation system
(3) stop breathing
(4) grit your teeth

37. If your attention is distracted while operating a machine
(1) don't move your hands, look up to see what it is
(2) continue working and answer to the distraction
(3) complete the operation and back away from the machine
(4) look up quickly so you won't miss anything

38. If any power machine does not work or cut properly
(1) shut off the power and tell the instructor
(2) inform the custodian
(3) repair it yourself
(4) yell a warning

39. All special set-ups must be inspected by the
(1) inspector
(2) another student
(3) instructor
(4) shop foreman

40. _____ has the most influence in preventing an accident to himself.
(1) the student
(2) the teacher
(3) National Safety Councel
(4) Cal. O.S.H.A.

TEST

HAND TOOL SAFETY PRACTICES

General Hand Tool Safety Practices

1. The tools should always be in
   (a) constant use
   (b) the tool room
   (c) good working condition
   (d) another shop

2. Sharp-edged tools are carried so that their points are held
   (a) up
   (b) inward
   (c) down
   (d) outward

3. Vise handles and control knobs are to be tightened by
   (a) hand
   (b) a hammer
   (c) wrench
   (d) a pry bar

4. Chips, shavings, and scraps are cleaned from benches and machinery with
   (a) a rag
   (b) a paper towel
   (c) an air hose
   (d) a brush

Hammers

5. Machined, tempered, or hardened surfaces are hammered with
   (a) claw hammers
   (b) ball peen hammers
   (c) soft-faced hammers
   (d) a and b

6. Before using a hammer, check the
   (a) tang and body
   (b) face
   (c) head and handle
   (d) shank

7. One of the first safety precautions in using a hammer is
   (a) to find a new hammer
   (b) to get some help
   (c) to be sure your hands are dry
   (d) b and d

8. The hammer should be held
   (a) in a choked position
   (b) midway between the head and the butt
   (c) in the butt end
   (d) where it is not split

9. Before swinging a hammer it is important to
   (a) check for students in front and back of you
   (b) spin the hammer
   (c) tell everyone in the shop
   (d) bring the hammer over your head

Chisels and Punches

10. Before using a chisel, punch, or drift, check to see that the head is
    (a) not mushroomed
    (b) not rusty
    (c) polished
    (d) oil soaked

11. When using a chisel you should
    (a) hold the work in your hands
    (b) always wear eye protection
    (c) get a friend to hold it
    (d) get the instructor to hold it

Screwdrivers

12. When selecting a screwdriver for a job, you should be sure
    (a) the blade is square
    (b) it is the correct size
    (c) the shaft is not bent
    (d) a, b, and c

13. When using a screwdriver on small objects, the object must not be held
    (a) in your hand
    (b) on the bench
    (c) in a clamp
    (d) in a vise

14. When prying objects, you should use a
    (a) screwdriver
    (b) bar
    (c) chisel
    (d) awl

15. When working with a screwdriver around electricity the
    (a) handle should be insulated
    (b) shaft should be plastic
    (c) handle should conduct electricity
    (d) screwdriver should be magnetic

16. Never use _____ to help turn a screwdriver.
    (a) pliers
    (b) shopcloth
    (c) two hands
    (d) b and c

Files

17. Before using a file, be sure it has
    (a) teeth
    (b) a tang
    (c) a handle
    (d) body

18. Files should be kept clean to avoid
    (a) breakage
    (b) slippage
    (c) chipping
    (d) chatter

Saws (Hack)

19. Hacksaw blades, if forced or set too tight in the frame, will
    (a) not cut
    (b) be damaged
    (c) cut unevenly
    (d) break and cause injury

Wrenches and Pliers

20. If a wrench is too small, it is best to
    (a) slip a piece of pipe on the handle
    (b) get a larger wrench
    (c) use a hammer
    (d) let it go

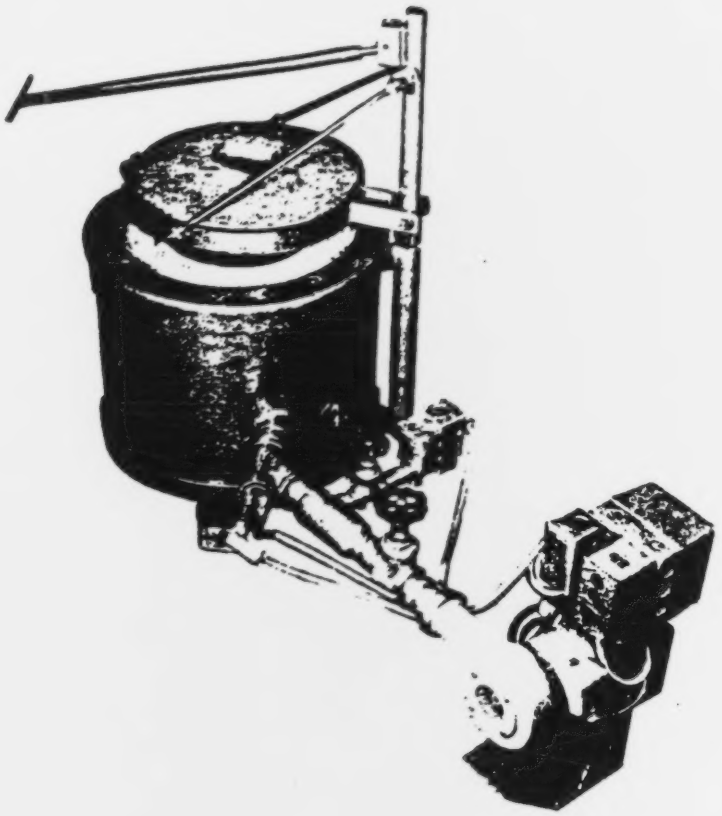
21. When using an adjustable wrench, always
    (a) pull toward the movable jaw
    (b) pull away from the movable jaw
    (c) hold the work with the tip of the jaws
    (d) none of these

22. Never apply a wrench to
    (a) moving machinery
    (b) hex nuts
    (c) bolt heads
    (d) brass fittings

23. Pliers are used to grip
    (a) round or irregularly shaped objects
    (b) stuck fasteners
    (c) brass or aluminum fittings
    (d) none of these

Awls and Scribes

24. Awls and scribes should never be
    (a) thrown or pointed at people
    (b) used for scribing lines
    (c) used for marking centers
    (d) none of these



FURNACE (CRUCIBLE)

1. When adding metal to a crucible containing molten metal,
   - (a)• preheat the metal to be added
   - (b) drop the cold metal into the crucible
   - (c) add flux before adding more metal
   - (d) none of the above

2. Molten metal reacts violently when
   - (a) the furnace is turned off
   - (b)• moisture or wet metal is added to the molten metal
   - (c) the metal is poured into the mold
   - (d) the slag is skimmed off

3. When pouring a casting, the observers should
   - (a) shout orders to the operator
   - (b) laugh and tell jokes
   - (c)• not interrupt the operator
   - (d) get in the operator's way

PEDESTAL AND BENCH GRINDERS

1. All grinders must be equipped with a glass safety shield and operators must also wear
   (a) a cap
   (b) gloves
   (c) an apron
   (d)• eye protection

2. The tool rest on the grinder must be set away from the grinder wheel not more than
   (a)• 1/8 inch
   (b) 7/8 inch
   (c) 1/2 inch
   (d) 3/4 inch

3. Grinding on the side of the grinding wheel, causes
   (a) flat wheels
   (b) burred edges
   (c) burned edges
   (d)• unbalancing and breakage

4. When grinding small pieces
   (a) use gloves
   (b) use goggles
   (c)• get instructor's permission
   (d) hold with fingers only

5. Apply pressure to the grinding wheel
   (a) with short, quick strokes
   (b)• slowly and gradually
   (c) with strong force
   (d) continually

6. Do not hold objects with rags when grinding because
   (a) the rag will burn
   (b)• the rag can tangle on the wheel
   (c) it looks unsightly
   (d) the material will tarnish

BAND SAW

1. Adjustments are made on the band saw only
   (a) when the guide is in position
   (b)• when the machine is stopped
   (c) when it is running slowly

2. A wide band saw blade must not be used on the band saw when
   (a) cutting thick wood
   (b) resawing
   (c) cutting soft wood
   (d)• cutting a sharp curve

3. If the blade breaks when using the band saw, first
   (a)• step to the left, and turn off the power
   (b) replace it immediately after the band saw has stopped
   (c)• shout a warning
   (d) call the instructor

4. The proper height at which to set the band saw's upper guide above the stock being cut is no more than
   (a) 3/8 inch
   (b) 1 inch
   (c)• 1/4 inch
   (d) none of these

5. Round stock such as a broom handle can be safely cut on the band saw
   (a) whenever necessary
   (b) only with instructor's permission
   (c)• when properly clamped so that it can't roll
   (d) never

6. The only way a band saw may safely be brought to a quick stop is
   (a) by pushing a stick into the blade
   (b)• by using a foot brake if so equipped.
   (c) coast to a stop

7. To avoid accidents from a broken band saw blade, do not stand
   (a) to the left of the operator
   (b) to the front of the operator
   (c) behind the operator
   (d)• to the right of the operator

9. When sawing sharp curves
   (a) use relief cuts
   (b) push stick
   (c) miter gauge
   (d)• none of these

POWER HACKSAW

1. Prior to starting a cut, the operator should
   (a) determine correct speed
   (b) be sure the stock is firmly secured
   (c) support long and heavy stock
   (d) all of the above

2. While the hacksaw is running, the operator should never
   (a) remove chips
   (b) catch the piece being cut off
   (c) make adjustments
   (d) all the above

DRILL PRESS

1. Drill press work should be held
   (a) with tongs
   (b) with hands
   (c)• in vise or clamped to table
   (d) by an assistant

2. When drilling thin metal, you should use
   (a) a pair of vise grip pliers
   (b) a pair of combination pliers
   (c) a pair of leather gloves
   (d)• a back up board and clamp

3. When working in the shop on revolving equipment, all jewelry, gloves, and loose clothing must be
   (a) left on
   (b)• removed or fastened
   (c) hidden

4. By removing the chuck key from the chuck spindle before turning on the power, you will prevent
   (a) chuck damage
   (b) drill breakage
   (c)• possible severe injury
   (d) unbalanced chuck

5. Before drilling a piece of material, it must always be
   (a)• center punched
   (b) broken
   (c) reamed
   (d) rammed

6. While setting belt for proper speed according to drill size, the larger the drill
   (a) the faster the speed
   (b)• the slower the speed
   (c) the harder the drill
   (d) the smaller the drill

7. No adjustments, removal of work, or cleaning must be done while any machine is
   (a) being repaired
   (b)• in motion
   (c) upside down
   (d) dirty

8. When work catches in the drill while the drill press is in operation you must
   (a)• turn off the power and stand clear
   (b) leave it running
   (c) remove chuck key
   (d) hold it with your hand

9. As the drill goes through the material, the pressure must be
   (a) taken off completely
   (b)• be eased up
   (c) increased
   (d) held

10. Keep hands away from the
    (a) drill
    (b) spindle or chuck
    (c) hot chips
    (d)• all of these

1. Before starting the lathe, have the instructor
   (a) inform everyone
   (b) clear the area
   (c) check the setup
   (d) measure the work

2. When ready to start the lathe, make certain others are not endangered by
   (a) putting on your goggles
   (b) removing hot chips
   (c) tightening all parts
   (d) getting all bystanders outside safety zone

3. Your clothing must be arranged so that they will not become
   (a) dirty
   (b) entangled in moving parts
   (c) obstructions
   (d) distractions

4. Eye protection is always used when operating a metalworking lathe to prevent
   (a) eye strain
   (b) poor workmanship
   (c) hair from getting in eyes
   (d) eye injury

5. Make adjustments and clean or oil the lathe only when
   (a) it is running slowly
   (b) it is started up
   (c) you think about it
   (d) it is stopped

6. Measure with micrometers or other measuring devices
   (a) before work begins
   (b) after work is finished
   (c) while machine is at a dead stop
   (d) none

7. Lathe chips are
   (a) cool when the lathe is operating slowly
   (b) cut from aluminum or brass
   (c) likely to burn and cut if you touch them
   (d) safe to handle

8. Before filing or polishing, remove the
   (a) headstock
   (b) tool post
   (c) saddle
   (d) gear box

9. When you are turning the work between centers, be sure to clamp
   (a) the material
   (b) the dogs
   (c) the tail stock
   (d) the arm rest

10. When turning between centers, keep the dead center properly adjusted and
   (a) clean
   (b) lubricated
   (c) cooled
   (d) heated

11. After using the chuck wrench in the chuck, remove it
   (a) immediately
   (b) before work is finished
   (c) before the bell rings
   (d) during cleanup

12. To protect the engine lathe ways, the chuck, and your fingers when removing a chuck, always use a wooden
   (a) mallet
   (b) block
   (c) handle
   (d) box

13. Finish cuts by hand feed when cutting near the
   (a) center
   (b) tailstock
   (c) chuck or shoulder
   (d) wall

SHAPER

1. Prior to starting a cut
   (a) clamp work securely
   (b) set work with machinist hammer
   (c) stand directly in front of ram
   (d) lean on machine

2. While the shaper is in operation
   (a) make adjustments
   (b) never remove chips
   (c) select proper tool bit
   (d) turn off the magnetic chuck

MILLING MACHINE

1. Adjustments should only be made when the machine is
   (a) running
   (b)* stopped
   (c) being oiled
   (d) being cleaned

2. To remove metal cuttings or chips from your work use
   (a) your hand
   (b) a clean rag
   (c)* a brush
   (d) a tool

3. When you have finished using the milling machine, you should
   (a) speed up all clutches and feeds
   (b) seat work against the parallels
   (c)* release all automatic feeds
   (d) select proper cutter

ARBOR PRESS, PUNCH AND DIE PRESS

1. Material must be properly _____ before using the arbor press.
   (a) positioned
   (b) cleaned
   (c) oiled
   (d) painted

2. Before securing the punch and die, make sure they are _____.
   (a) clean
   (b) mated
   (c) edged
   (d) keyed

II. Introduction to Machine Shop

A. Basic Machines

1. Text Assignment - Machine Tool Metalworking
   Unit 1 - The Five Basic Machines
   Pages 1 through 14

2. Text Assignment
   Unit 2 - Metal Cutting and Cutting Fluids
   pages 15 through 20

3. Text Assignment
   Unit 3 - Mechanics of Machines
   pages 20 through 35

B. Shop Mathematics

1. Text Assignment
   Unit 5 - Using Mathematics
   pages 37 through 42

2. Text Assignment (Handout)
   Principals and Problems of Plane Geometry by
   Barnett Rich.
   (1) Lines, Angles, Triangles
   pages 1 through 6
   (2) Circles

1.b Assignment (handout) from
Machinery's Handbook. pg. 1 through 40
Mathematical Tables - Powers, Roots, Reciprocals
pg. 148 Areas & Volumes (Formulas)

2. Text Assignment - Measuring and Gaging
   pg. 65 through 121
   a. Unit 10 Principles of Measurement
   b. Unit 11 Basic Measuring Tools
   c. Unit 12 Using Calipers
   d. Unit 13 Reading and using a Micrometer
   e. Unit 14 Using Vernier Tools
   f. Unit 15 Dial Indicating Gages
   g. Unit 16 Gage Blocks and Gaging
   h. Unit 17 Sine Bar and Angle Gage Blocks
   i. Unit 18 Making a Layout

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAINING LESSON PLAN # 10

Teaching Materials Source Machine Tool Metalworking

Chapter 1

pages

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Students will learn of the historical development and use of the five basic machine types.	see Glossary	see Glossary 2.2 2.7	Demonstration and Lectures.

Materials and Notes

Text books

Length of Lesson	Evaluation
2 hrs	Written Test

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAIN[illegible] LESSON PLAN # 11

Teaching Materials Source Machine Tool Metalworking

Chapter Metal Cutting

pages 15 - 20

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
The physiology of cutting different metals.	see Glossary	see Glossary 2.5 2.6	Demonstration and Lecture

Materials and Notes

Text Book

Length of Lesson	Evaluation
2 hours	Written Safety Test

GENERAL MACHINIST CURRICULUM

VOCATIONAL TRAIN[illegible] LESSON PLAN # 12

Teaching Materials Source Machine Tool Metalworking

Chapter Mechanics of Machines

pages 20 - 34

Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
1. Simple concepts of transmitting power a. pulleys b. gears c. tapers d. bearings e. lubricants f. limits, tolerances, fits	see Glossary	see Glossary 3.2 3.3	Demonstration and Lecture

Materials and Notes

Use various machines and apparatus in the shop as examples.

Length of Lesson	Evaluation
2 hours	Written

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 13

Teaching Materials Source Machine Tool Metalworking
Chapter Using Mathematics
pages 37 through 42
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
1. Taking measurements. a. conversion of decimal to fractions and fractions to decimals.	divider spacing collar working drawing slotted plate	see Glossary 1.1 1.3	
2. Physiology of a circle and other geometric shapes.			
3. Common algebraic formulas used in shop situations.			
4. Beginning drafting and blueprint reading skills.			

Materials and Notes

Length of Lesson

Evaluation

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 14

Teaching Materials Source Measuring and Gaging
Chapter
pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
1. Students will learn the principles of measuring and how it relates to our industrialized society.	see Glossary	see Glossary	Discuss principles of measuring with American and Metric systems.
Students will learn how to use precision measuring tools.			Demonstrate measuring with the many tools in the shop.
Students will learn how to make a layout of work to be accomplished.			Demonstrate layout procedure and have student do their assignment.

Materials and Notes

Micrometers
Vernier Calipers

Length of Lesson	Evaluation
5 days	Written tests and observation of student Lab work.

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY
Machine Tool Metalworking

Machine Tools
metal manufacturing methods
forming
cold forming
casting
cutting tools
abrasives
machining process
saws
drills
planes
sanders
tractors
combines
cultivators
grain millers
chemical fertilizers
threshing machines
mills
refineries
processing plants
electronics
atomic power
rockets
files
electric motors
"tooling up"
plain milling machine
drill jigs
fixtures
work-holding device
workpiece
hardened steel bushings
foot-operated lathes
drilling presses
crude milling machine
designed
available
fabrication
snap gages
milling machines
drilling machines
shapers
grinders
special-purpose machines
electronic and hydraulic controls
single-point tool
the engine lathe
shaper
planer
multiple-point cutting tool
milling-machine cutter
drill
reamer
broach
grinding wheel
steel
stellite
carbide
diamond
ceramics
carbide
aluminum oxide
bar stock
forgings
castings
stainless
copper-based alloy
magnesium
titanium

impact
pressure
electrical techniques
metalworking shop
attachments
automated or transfer machinery
one-thousand of an inch
a millionth of an inch
three-hundreths
workbench
transfer lines
boring
reaming
tapping
turning
milling
planing
broaching
honing
stamping
punching
shearing press
combination milling
planning machine
forging
a rotating drill
revolving
turret lathe
engine lathe
multisided toolholder
stationary
multiple-spindle automatics
planers
slotting
gears
multiple-toothed revolving cutting tools
hobbing machines
rotating abrasive wheel
heat-treated
distortions
abrasive pastes or compounds
vertical band saw
machine filing
countersinking
counterboring
cylindrical hole
metallurgy
synthetic materials

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Machine Tool Metalworking

Cutting fluids
grinding wheel
machinability
Molybdenum steel
low-carbon
tree-cutting steel
steel alloyed
tungsten
tungsten carbide
ceramic tools
slicing knife
square edge
wedging-apart action
penetrating edge
fine steel blade
soft-iron nail
cold chisel
per square inch (psi)
plastic flow
concentration of stress
discontinuous (segmental) chips
cast iron
hard bronze
disposed of
the pitch of the segments
continuous chip
"buildup"
ductile materials
reduce friction
pressure-weld
cast steel
malleable iron
monel metal
alloys
forgings
manganese
wroght iron
sulfurized oil
mineral-lard oil
lard oil
kerosene
drilling
reaming
turning milling
threading
mechanics
shear plane
sufficient torque

GENERAL MACHINIST

TECHNICAL VOCABULARY

Machine Tool Metalworking

heavy-duty lathe
electrical energy
mechanical energy
gears
belts
pulleys
headstock spindle
the carriage
the lever
the wheel
axle
the pulley
the inclined plane
the screw
the wedge
a teetertotter
leverage (mechanical advantage)
fulcrum
pivot point
lever class
rim of the wheel
transmit motion
plank or platform
inclined plane
a cam
rotary motion
irregular rotary
reciprocating motion
taper
center
rod or cylinder
jack screw
power-driven machine
metal-forming machine
press, forge, emboss, hammer, or shear metal
electric discharge machin
electrochemical machining
magnetism
conventional machines
belt drive
driver pulley
driven pulley
flat pulleys and belts
crowned pulley
V-belts and pulleys
V-shaped groove cut
veriable-speed pulley
adjusting screw
crank wheel
gears
revolving shaft
friction drive
slippage
the headstock spindle
the lead screw
drivers
driving gears
followers
driven gears
gear trains
compound gear train
idler gears
gear ratio
same rate of speed (rpm)
inverse one
gearlike devices
nonslip drive
spur gears
helical gears
herringbone gears
bevel gears
right-angle drive
miter gears
spiral bevel gear
hypoid gears
pinion gear
worm gears
rack and pinion
reciprocating (back & forth)motion
internal gears
compact
internal gears
compact
taper-shank twist drills
taper-shank tools
tailstock spindle
alignment
self-holding
"self-releasing"
taper per inch (tpi)
the taper per foot (tpf)
Brown and sharpe tapers
Morse standard taper
twist-drill shank
the Jarno taper
diemaking machines
American Standard machine tapers
Morse and Brown and Sharpe Systems
arbors
adapters
horizontal milling machines
cam lock
draw-in-bolt arrangement
bearings
dovetailed

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

Machine Tool Metalworking

plain or sleeve bearings
a simple bushing
a journal
a mirrorlike finish
super finish
ball bearings
precision-made bearings
inner race
outer race
retainer ring
antifriction bearings
proper lubrication
roller bearings
needle bearings
lubricants
plain circular bearing
cooling agent
refined mineral oils
limits, tolerances, and fits
bilateral tolerance
unilateral tolerance
hand-fitting
sliding fits
cross and traversing slides of lathes
scraping
stationary parts
adjustable contact strips or gibs
crank pins
limits
collars
hubs
flanges
allowances
tolerance standards
cylinrical gages
enternal ring gages
snap gages
hardened
ground
lapped
scrap pieces

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

MEASURING AND GAGING

jigs
fixtures
templates
jo blocks
a flat disk
optical flat
johansson gage blocks
production gage
interferometry
electronic gages
fixture
identify
wavelength
benchwork
steel rule
graduations
plain or tempered steel rule
graduations
flexible steel rule
hook rule
reference point
inside caliper
rule depth gage
caliper rule
pocket slide caliper
keyseat rules
splining keyways on shafting
circumference rule
shrink rules
core boxes
tin alloys
square head
bevel protractor
center head
spirit level
round shaft
double square
drill point
try square
hardened steel square
steel protractor
bevel protractor
thumb nut
precision universal bevel protractor
graduated dial
swivel plate
vernier plate
protractor dial
caliper
outside caliper
firm-joint caliper
spring-joint caliper
spring tension
knurled nut
slots, groves, and keyways
micrometer
recesses
feel
outside micrometer
inside micrometer
depth micrometer
micrometer depth
screw-thread micrometer
anvil
spindle
sleeve
barrel
hub
thimble
lengthwise
tarnish and rust
diameters of cylinders and rings
rod length
rod shoulder
measuring rods
wear
knurled extension handle
lapped base
precision ground
sleeve graduations
digital readout micrometer
conventional micrometer
graduated scales
digital mike
speedmike
deep-throated frame
the barrel
vernier caliper
L-shaped frame
the bar (beam)
internal
external
plus intermediate beam graduation

GENERAL MACHINIST
TECHNICAL VOCABULARY

MEASURING AND GAGING

vernier height gage
upright bar
vernier depth gage
magnifying glass
toolmaker's eye loupe
scribing attachment
dial indicating gages
quality control operations
dial indicators
plunger-type indicator
contact point
rack teeth
amplifying gear train
test-type indicator
types of dials
balanced-type
continuous-dial-type
pointer
standard gaging equipment
comparators
V-blocks
vertical post
checking runout
concentricity
straightness
surface alignment
transferring measurements
hand gages
pocket gages
sheet gages
depth gages
inside gages
crankshaft or distortion gages
cylinder gages
out-of-roundness gages
dial bore gages
cylindrical bores
a true bore
out-of-round
bell-mouth
hour-glass
barrel shape
contact head
indicator housing
centralizing plungers
3-point contact
gaging contact
nonshock dial indicator
magnetic base
grinding operation
universal indicator
dial indicator diameter gages
rigid box-section beam
friction-free motion transfer mechanism
direct-reading dial indicator
dial indicator internal groove gages
pistol-grip frame
sensitive jaw
adjustable reference jaw
hard chrome gaging contacts
thumb lever
motion transfer mechanism
dial indicator snap gages
universal indicator gage
wiggler
centering stock
four-jaw chuck
dial indicating micrometer
snap gage
built-in dial indicator
gage blocks and gaging
tolerance
monochromatic light
single wavelength
krypton 86 gas
industrial standards
calibrating precision
masters
grand master blocks
tool steel
chrome-plated steel
stainless steel
chrome carbide
tungsten carbide
"jo" blocks
make a block measuring
gage blocks
cementing
wrung blocks
molecular traction
cementing action
fixed-type gages

GENERAL MACHINIST
TECHNICAL VOCABULARY

MEASURING AND GAGING

a plug gage
"go" gage
"no-go" gage
precision gage blocks
assembling gage blocks
dovetail
an electronic comparator
cylindrical plug
self-aligning plug gages
ball-bearing pilot end
chamfered end
taper ring gages
gaging buttons
tolerance
snap gages
master gages
gage inspection department
electronic gages
untraprecision gaging
air-operated gages
air-jet sensing
nozzle
optical
optical system
optical flats
toolmakers' microscopes
optical comparators
gear profiles
comples profiles
sine bar
compound sine plate with permanent magnet top
natural sines
"ring"
a shop term
mechanical drawing
bench vise
machinist's vise
swivel base
finished job
vise jaw caps
machinist's hammer
peening
ball-peen
cross-peen
straight-peen
mallets
scriber
prick punch
prick-punch mark
center punch
surface plate
handscraped
V-blocks
parallel bars
surface gage
upright spindle
rocker arm
adjusting screw
cast-iron surface plate
surface gage
the combination square
divider
spring-type divider
knurled nut
hermaphrodite caliper
angle plate
toolmaker's clamp
parallel clamp
knack
trammel
beam
toolmaker's parallel clamps
steel-beam trammel
vernier height gage
flat scriber point
layout die
blue vitriol
copper sulfate
sulfuric acid
white coating
well-tempered point
burr
distortion
single crisp tap
dimple
steady the tool
base line
ratchet
adjusting nut
barrel spring
barrel

GENERAL MACHINIST
TECHNICAL VOCABULARY

MEASURING AND GAGING

spindle
anvil
frame
measuring surfaces
thumb lock
barrel scale
thimble scale
thimble
combination square
reference surfaces
square
height gage
depth gage
marking gage
narrow flexible rule
slide caliper rule
assortment
hardened dowels
bars
extension collars
base units
pipe rings

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Machine Tool Metalworking

desired shape
dimension
measure of man's progress
extension
complicated
tremendously
affected
governed
equipment
cease to exist
modern conveniences
extremely
limits of accuracy
rates
intricate metal parts
assembled
output
sophisticated equipment
fold
facilities
textiles
petroleum products
processing equipment
techniques
standard of living
distribute
substitute
mass production
contribution
gunsmith
musket
individually
specialized labor
standardized
eliminated

skilled craftsmen
interchangeable parts
credited
design
was
shortened to
permanently
standard of measurement
crude
tolerances
interchangeability
primary requirement
necessities
economies
at moderate cost
varieties
adapted
complex
combination
two main categories
contour
portions
assortment
chemicals
magnetism
liquids
capabilities
conventional equipment
authorities
category
shearing
squeezing
discussed
performed
specific nature

successive
loaded
is referred to
precision
standing characteristic
dimensional accuracies
feasible
identical
alike
mounted
house
range
classifications
identified
complexity
simplicity
employed
disintegrating
corrosion
erosion
force characteristics
dawn of civilization
originating
advanced
sequence
resetting
relieve
monitoring
gaging
essential
portable
fixed position
vertically
indexed
consists
generating threads
in heavy-duty metal removal operations
lapping

entails
desirable
described
internal and external
horizontal
enlarging

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Machine Tool Metalworking

shorn away
curl
intelligently
characteristics
toughness
malleability
brittleness
ductility
substance
immediately
upon contac with
exerted
word fibers
by contrast
compresses
minute particles
an elastic band
molded clay
deformed
shear
ideal
anchor
lodge
fragments
the amount of wear
indicates
emulsion
adequate
deflection
is equipped with
emulsion
capability
expended

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Mechanics of Machines

transform energy
portable
assortment
ensures
circumference
by means of
positive motion
mesh with
parallel
the profile
durability
advantage
calculate
time-consuming
are capable of
value
prevents
overcome
corrosion
petroleum
manufactured
interchangeable
in other words
mechanism
individual
impractical
essential
sufficient firmness
ordinary
desired results
specifications
submitted
reference
notation
figured dimensions
dictates
as to
detail drawings
prominently
equivalents
permissible
customary practice
universally
considered as
representative
manner
instructions
horseplay
suggestions
work trousers
commercial work
reasonably
daydreaming
temptation
imbedded
infection
attempting
tripping hazards

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

MEASURING AND GAGING

activities engaged
dwellers
crude
fashion
base
uniform
Magna Charta
tremendous
standardizing
iron ulna
constancy
permanence
adopted
metric system
meter
volume
litre
preferred
North Pole
Equator
linear systems
decimeters
1 dekameter (dam)
1 hectometer (hm)
survived
millimeters
centimeters
meters
kilometers
provision
derived
cubic decimeter
kilogram
convert
millimeters
proposals
mandatory
technology
feature
customary
convert
a pile of raw materials
prefixes
subdivision
backbone
technological economy
specialization
reconciled
visualize
dual dimensioning
eliminates
installed
conversion unit
parentheses
minimum
maximum
digits
bilateral tolerance
adjacent
abbreviation
roundoff
photographic
regardless of
painstakingly
analyze
microscope
spectroscope
suitable
inherent
graduated
various combinations
inner surface
axis of cylindrical work
contractions
vary
labeling
wipe off
square
combination set
prolonged
degree
minutes
seconds
turret
vernier
vernier protractor
coincides
sensitiveness

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

MEASURING AND GAGING

telescoping gage
distances of shoulders
projections
are classified as
preserve
locate
guide
correct spot
implies
inserted
protrudes
contacts
compensate
adjusting nut
unique
in combination with
differ from
and so on
prefer
to a
procedure
prevent eyestrain
approximate position
index line
inspection
arrangements
extends
pivots
been incorporated in
duplicate
accomodate
mounted
multipurpose tool
specialized types
detect
actuates
crankshaft
are available with ranges from
increments
consists of
is retracted by
emitted
verifying
certify
designated
patent
obviously
improper handling
environmentally controlled laboratory
interfere with
a chamois
perspiration
stacking
wrung
constitutes
adhere to
specified limits
be inserted
overcome
are designed
periodically
magnify
a magnified scale
category
implies
equal diameter
surface plates
relatively
device
trigonometry
are hinged
blueprints
transfer
serrated
varies
irregular
intersection
indentation
slanting
extremely
caution
scriber
vertically
duplicate pieces
required
parallelism
rectangular
satisfactory
rub off
dents
nicks
trueness

GLOSSARY

GENERAL MACHINIST
RELATED GENERAL VOCABULARY

MEASURING AND GAGING

intersection
great asset
impression
methods
available
procedures
suggestions
underneath
horizontal
evolution of
original
and etc.
calibrate
a substitute
enables
to be used
reliable
nonstationary object
stationary object
forearm

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

Using Mathematics

Activities : Hoạt động, Sinh hoạt
Engaged : Hứa hẹn, muốn trước, bận, khiến chú ý
Dwellers : Người ở trú
Crude : Nguyên chất, chưa luyện
Fashion : Cách làm, theo cách thức, thời trang
Base : Đường chân, phần dưới
Uniform : Đồng hình, đồng phục
Tremendous : Dễ sợ, kinh hãi, to lớn
Standardizing : Chuẩn đích, tiêu chuẩn
Iron ulna : sắt, còng, ủi ---- xương khuỷu, xương tay trụ
Constancy : Vững vàng, kiên nhẫn
Permanence : Dài hạn , thường xuyên
Adopted metric system : Dùng hệ thống metric
Meter : thước, mét, máy tính số, lượng
Volume : cuốn, thể tích, âm lượng, máy âm thanh
Litre : Lit
Preferred : Ưa hơn, thích hơn
North pole ; Bắc cực
Equator ; Đường xích đạo
Linear system : Hệ thống đường thẳng
Decimeters : Decimeters
Dekameter : Dekameter
Hectometer : Hectometer
Survived : Sống sót, còn lại
Millimeters : 1/1000 của thước
Centimeters : Phần trăm
Kilometers : Kilometers
Provision : Sự dự bị, sắp đặt trước, đề phòng
Derived : Lấy từ trong, tìm, nhổ, do ở đâu ra
Cubic Decimeter : Có hình khối, lập phương, bực ba ---- Decimeter
Kilogram : Kilogram
Convert : Làm đổi
Proposals : Sự đề nghị
Mandatory : Ra lịnh, truyền lịnh, thụ ủy

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Using Mathematics

Resulted in : Kết qủa trong
Technology : Kỹ thuật học
Feature : Nét, đặt tính, tả ra, miêu tả
Customary : Thường, quen, theo thói quen
A pile of : Một đống, một chồng của
Prefixes : Tiếp đầu ngữ, thêm, lời nói đầu
Subdivision : Sự chia ra, chi nhánh, phân bộ
Backbone : Xương sống
Technology Economy : Kỹ thuật học về tiết kiệm, cần kiệm
Specialization : Chi rõ, chuyên môn
Reconciled : Hòa giải, điều, giải, dàn xếp
Visualize : Làm có thể thấy, gợi lại, nhắt lại
Dual Dimensioning : Hai, chia làm hai, số ít và số nhiều ---- kích thước, mẫu, kiểu
Eliminates : Loại ra, trừ ra, bỏ ra
Conversion unit : Sự đổi, cái biến ---- một, một cái, đơn vị
Installed : Đặt để, vô lập, dựng
Parentheses : Đóng ngoặc
Minimum : Tối thiểu
Maximum : Tối cao, cực, điểm, tuyệt đích
Digits : Ngón tay, ngón chân, 9 số và số 0
Bilateral Tolerance : Hai bề, hai mặt ---- ti lệ, hiệu số
Adjacent : Kề nhau
Abbreviation : Viết tắt, tóm tắt
Round off : Làm cho chẵn số
Photographic : Nhiếp ảnh
Painstakingly : Siêng năng, cần mẫn, kỹ lưỡng
Analyze : Phân tách, nghiên cứu
Microscope : Kiến hiển vi
Spectroscope : Kiến quang phổ
Suitable : Thích hợp
Inherent : Tự nhiên, cố hữu
Graduated : tốt nghiệp, đầu, phân độ
Various Combinations : Khác nhau, nhiều ---- sự hoà hợp, đoàn thể, tập đoàn

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

Crucible Furnace

Furnace : Lò, nơi nóng như thiêu, như đốt, lò lửa

Crubible : Nồi nấu kim thuộc

Castings : Sự quáng, liệng, ném, chiếu, soi, rút, bắt thăm

Foundry : Xưởng đúc, lò đúc

Molten metal : Loại thép đã được đốt cháy, kim luyện, kim khí

The skimmer : Trám, máy dùng để trám các vật kim loại

Hot Metal : Loại kim khí nóng

Safety zone : Khu vực an toàn

The parting line : Đường thẳng đã được ngắn chia

Flux : Sủi trào ra, tuôn ra, sự tháng trầm, biến chuyển, phun ra, vot ra, cháy ra, vật trộn với kim khí để nấu cho mau chảy ra

Slag : Cứt sắt, cứt kim thuộc

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

Machine Tool Metalworking

Heavy-duty lathe : 1 loại máy tiện lớn
Electrical energy : Năng lượng về Điện Tử
Mechanical energy : Năng lượng về Cơ Khí (máy)
Gear : Bánh khía, bánh răng cưa
Belt : Dây Cu-roa
Pulley : Bánh tròn
Headstock spindle : Trục máy tiện
The carriage : Bộ phận mang
The lever : Cần đòn bẩy, đòn cân
The Wheel : Bánh xe, tay lái
Axle : Trục, cần xe
The inclined plane : Mặt phẳng nghiêng
The Screw : Con ốc
The wedge : Cái nêm(bằng sắt hoặc gỗ)
Leverage : Hệ thống đòn bẩy
Fulcrum : Điểm tựa chốt quay
Pivot point : Điểm trục cố định, Cốt
Lever class : Hạng đòn bẩy
Rim of the wheel : Vành bánh xe, tay lái
Transmit motion : Chuyển động phát (truyền thanh)
Plank or Platform : Phiến gỗ hoặc cái bục
Cam : Ráng cưa
Rotary motion : Chuyển động quay
Irregular rotary : Chuyển động không bình thường
Reciprocating rotary : Chuyển động xoay chiều
Taper : Đèn đội, hình nón
Center : Giữa, chính giữa
Rod or cylinder : Cần sắt hoặc ống xy-lanh
Jack screw : Con đội ốc
Power - Driven machine : Loại máy chạy bằng Power
Metal - Forming machine : loại máy làm bằng kim loại
Press : Ép - Forge : Rèn - Emboss : Dập(chạm nổi lên) - Hammer : búa -
Shear metal : Kéo cắt kim loại
Electric discharge machine : Loại máy phóng điện (thoát điện)
Electrochemical machining : Loại máy điện hóa học

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

Machine Tool Metal-working

Magnetism : Nam châm hóa

Conventional machine : Loại máy được chế biến theo 1 sự hiệp ước

Belt drive : Chạy bằng dây Cu-roa

Driver pulley : Chạy bánh trốn

Driven pulley : Chạy bằng bánh trốn

Flat pulley and belt : Bánh trốn và Dây Cu-roa mỏng (bằng phẳng)

Crowned pulley : Vòng bánh trốn

V-belts and Pulleys : Loại dây Cu-roa và Bánh trốn hình chữ V

V-shaped groove cut : Cắt đường rãnh theo hình chữ V

Veriable-speed pulley : Loại bánh trớn có thể chỉnh vận tốc quay

Adjusting Screw : Loại đinh, ốc có thể chỉnh được

Crank wheel : Tay quay bánh lái, Bánh xe

Gears : Bánh khía, Bánh răng cưa

Revolving shaft : Cần, Trục quay tròn

Friction drive : Sự truyền cơ bằng ma-sát

Slippage :

The head-stock spindle : Trục máy tiện

Driving gears : Bánh khía phát động, Bánh răng trục sơ cấp

Gear trains : Những bộ phận bánh răng cưa

Compound gear train : Bộ phận bánh răng cưa phức tạp (kép)

Idler gears : Bánh quay tròn

Gear ratio : Tỉ lệ bánh khía, răng cưa

Same rate of speed (rpm) : Cùng một vận tốc, vận tốc chu kỳ mỗi phút

Inverse one : Nghịch, ngược.....

Gearlike devices : Nhưng bộ phận, cơ quan về bánh răng cưa

Nonslip drive : Nonslip : Không thể trược được

Spur gears : Loại bánh răng cưa có góc 90 độ từ răng đến cạnh của vòng bánh xe

Helical gears : " có góc độ khác (không phải 90 độ) "

Herringbone gears : " mà độ nghiêng của răng (cả hai bên) từ đường giữa ăn khớp với nhau.

Bevel gears : " dùng để tạo công xuất giữa hai cây láp (trục) khi giao nhau tại một góc độ.

Miter gears : " """ một góc 90 độ.

Spiral bevel gears : " mà một trong những răng cấu tạo (gây nên) một phần của cuộn dây xoắn ống. (lao tuyến)

Hypoid gears : " giống (Spiral bevel gears)

Worm gears :

Impact : Sự đụng, chạm
Pressure : Sự ép, áp lực, đè, gấp, vội vàng
Electrical Techniques : Kỹ thuật điện
Metalworking shop : Tiệm làm thiếc
Attachments : Sự thắt, buộc, quyến luyến, ái mộ
Automated or transfer machinery : Máy tự động
One-thousand of an inch : Một tấc của một ngàn
A millionth of an inch : Một tấc của một triệu
Three-hundreths : Ba phần trăm
Workbench : Băng để làm việc
Transfer lines : Sự dời, đổi, di chuyển ---- sợi chải rối, dây, kẻ, gạch hàng
Boring : Phiền, chán
Reaming : Ram giấy, gặt, thầu
Tapping : Cái chốt để nút, lỗ giùi trên thùng rượu, cái đánh, đập, vỗ nhẹ
Turning : Xoay, quay, vặn
Planing : Địa đồ, họa đồ, vẽ, trù định, trù liệu
Broaching : Que dùng lụi thịt nướng, mở đầu, bàn tới
Honing : mài cho bén
Stamping : Sự giậm mạnh chân xuống, dấu
Shearing press : Kéo lớn, cắt, xén, hớt ---- sự ép, nhận, ấn, vội vàng, bắt buộc
Combination milling : Sự hòa hợp, kết hợp, hội, đoàn thể---- cối xay, máy xay, xưởng dệt
Planning machine : Trù định, họa đồ, vẽ ---- máy, máy móc
A rotating drill : Thay phiền ---- cái khoan, luống đất
Revolving : Xét lại, xoay quanh, hồi chuyển, tuần hoàn
Turret lathe : tháp nhỏ ---- khuôn tiện, máy tiện
Engine lathe : Máy, máy móc, võ khí ---- khuôn tiện, máy tiện
Stationary : Không động đậy, đứng yên ở một chỗ
Multiple-spindle automatics : Nhiều, nhiều phần ---- cái mũi quay, con quay ---- tự động
Planers : Người trù định
Slotting : Khắt, khía, đường khía, đường hở dài như miệng
Gears : Đồ đạc, đồ dùng, khớp nhau
Multiple-toothed revolving cutting tools : Đồ dụng cụ với nhiều ráng cắt xoay được
Rotating abrasive wheel : Thay phiền ---- chất dùng để mài, giũa, cọ ---- quay tròn, xoay
Distortions : Làm sai hình dáng, méo mó, siêu vẹo
Abrasive pastes or compounds : Kẹp, hộp chất
Vertical band saw : Đường thẳng ---- dây, đoàn ---- cưa
Machine Filing : Máy giũa
Countersinking : Khoan loe miệng, làm rộng lỗ để đóng chốt hay ngạt vào
Cylindrical hole : Hình ống, hình trụ ---- lỗ, hang

Metallurgy : Thuật nấu, lọc khoáng vật để lấy kim thuộc

Synthetic materials : Cao su, nhân tạo ---- vật chất

III. Metal - The Study of

A. Text Assignment - Materials
pgs. 518 through 533

(1) Unit 97 - Metal and Alloys
(2) Unit 98 - Machinability of Steel
(3) Unit 99 - Heat Treatment and Testing

1) Handout - Metals, properties of metals and their uses.
2) Handout

B. Text assignment - Unit 6 - Selecting Metals
pgs. 42 through 46

GENERAL M[illegible]NIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 15

Teaching Materials Source Machine Tool Metalworking
Chapter Materials, pages 518 - 534
Lab Manual pages
Additional Instructor Materials Metals - Properties of Metals and their uses.

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
1. The student will learn that there are many different kinds of metal and ways that we use them. 2. They will learn of the different melting points. 3. They will learn of the different properties of these metals.	see Glossary	see Glossary	Demonstration and Lecture --- Students are to do destructive on different metals.

Materials and Notes

Length of Lesson	Evaluation
3 hours	Written and observation of student activities.

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

METALS

metallurgy
metallurgists
grades
alloys of
ferrous
iron bearing
nonferrous
resistance
aluminum-bronze alloy
corrosion-resistant
alloy
for screw making
magnesium
lead
copper
cobalt
nickel
iron
tin
zinc
aluminum
magnesium
corrosion
platinum
potassium
oxidize
protective coatings
conducting electricity
conductivity of heat
ration
coefficient of expansion
linear expansion
plasticity
hardness
strength
melting points of metals
wrought iron
pig iron
applied loads
tensile strength
compression strength
shear strength
flexural strength
impact strength
stiffness
deflection
elasticity
plasticity
ductility

hardness
abrasion
load
stress
deformation
strain

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

METALS

composition
react
suited
consequently
properties
characteristics
physical characteristics
applications
ordinarily
in instances
susceptability
size for size
weight for weight
identical to
tremendous
synonymous
relative
definitions
descriptions
acquainted with
classification
determination
performance
encountered
in a general sense
excessive deformation
permanent
elongation
cross sectional area is
subject to
machine element

IV. Bench Metal Procedures

A. Hand Tools

1. Text Assignments

pages 122 through 185

a. Unit 20 Cutting With a Hacksaw

b. Unit 21 Cutting With A Cold Chisel

c. Unit 22 Filing, Broaching & Scraping

d. Unit 23 Abrasives and Their Uses for Hand Polishinig

e. Unit 24 Using a Bench or Pedestal Grinder

f. Unit 25 Screw Threads and Thread Measuring

g. Unit 26 Cutting Screw Threads with Taps & Dies

h. Unit 27 Reaming at the Bench

i. Unit 28 Metal Fasteners and Tools for Assembling

j. Unit 29 Safe Use of Hand Tools

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 16

Teaching Materials Source Machine Tool Metalworking
Chapter Bench Metal, pages 122 to 185
Lab Manual pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
The student will learn to identify and use many of the common hand tools used in the machine shop.	see Glossary	see Glossary	Demonstration and lecture.
		3.5 4.5	Students will use lab time to construct.

Materials and Notes

Length of Lesson	Evaluation
5 days	Written and observation of student activities.

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

BENCHWORK

hacksaw
bar stock
pistol-grip handles
blades
carbon steel
tungsten alloy steel
molybdenum steel
molybdenum high-speed steel
tungsten high-speed steel
all-hard
semi-flex
flexible back
pitch of a blade
32-pitch blade
brass tubing
thick-wall metal conduit
tooth set
kerf
alternate set
a wavy set
cleaner cuts
chip clearance
cutting load
straddle
front
stretcher
taut
strained
thumbed
buckling
cold chisel
wedge-shaped cutting tool
flatcold chisel
rivets
diamond-point chisel
cape chisel
roundnose chisel
flutes
soft jaws or caps
mushroomed
good shearing action
a firm blow
filing
broaching
multiple cutting-edges
rattail file
single-cut file
double-cut file
curved-tooth file
bastard-cut file
second-cut file
smooth-cut file
flat
hand
pillar
warding
square
round
three-square
half-round
knife
Swiss pattern files
special-purpose files
machinist's files
mill file
drawfiling
long-angle lathe file
scoring
chatter
pinnings
metal scorer
filing nonferrous metals
pry bar
a file card
drawfiling
twisting movement
reamed
bushings
shim
scraper
flat-type scraper
honing
bearing or half-round scraper
three-square scraper
prussian blue
figure-eight pattern
frosting or flaking
journal of the bearing
abrasives
emery
crocus
mineral bauxite

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

BENCHWORK

coke and iron filings
electric furnace
silicon carbide
buffing
artificial diamonds
ceramics
lacquer
enamel
lump form
sedimentation
air flotation
coated abrasive products
adhesive-coated backing
hide glues
synthetic resins
modified glue
modified resin
resin-bonded products
closed coating
loading up
vitrified
silicate
shellac
rubber
resinoid
straight wheel
polishing grains
stones and sticks
drawfiled
pedestal-type grinders
offhand grinding
mounted on
shaft
safety guard
concealed illumination
adjustable U-shaped rests
V-belt drive
safety-glass eyeshields
glazed wheel
dressing
offhand tool grinder
trued
disk-type dresser
star dresser
separators
diamond dresser
square up
taps
screw thread
spiral (helical)
Machinery's Handbook
The New American Machinist's Handbook
crude foot-operated lathe spindle
thread combing tool
master or lead screw
tangential-type thread-cutting chasers
helix
screw thread
external thread
major diameter
minor diameter
pitch diameter
crest
root
thread angle
flank
height of thread
slant depth
axis
angle of thread
pitch
lead
single thread
multiple threads
right-hand thread
left-hand thread
thread fit
thread series
thread form
axial plane profile
allowance
minimum clearance
positive allowance
maximum interference
negative allowance
tolerance or allowance
electroplated
fasteners
coarse or fine series
American National Standards Institute (ANS)
American Society of Mechanical Engineers (ASME)

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

BENCHWORK

Industrial Fastening Institute (IFI)
international metric thread
International Organization for Standardization (ISO)
IFI metric threads
66 diameter-pitch combinations
acme screw thread
American pipe threads
National pipe thread (NPT)
screw-pitch gage
adjustable thread snap gages
plain snap gages
ring gage
screw plate
flutes
four-flute hand tap
V-shaped interchangeable anvils
spindles
indicating thread gage
pitch diameter
spiral-fluted tap
spiral-pointed tap
maximum chip relief
non-free-machining alloys
blind-hole tapping
shearing action
plug taps
taper taps
bottoming taps
left-hand taps
finish-cut
½-13NC (UNC)
adjustable tap wrench
T-handle tap wrench
adjustable or split die
setscrew
die stock
two-piece die
solid square die
rethreading die
drunken thread
tap extractors
reaming
hand reamers
expansion hand reamers
adjustable hand reamers
taper reamers
roughing reamer
finishing reamer
burring reamers
counter-sinking holes
forward rotation
metal fasteners
machine bolt
torquing
countersunk head
semifinished bolt
finished bolt
heavy-type bolt
cap screws
fillister heads
machine screws
binding
pan
truss
clearance or body-size hole
Phillips-type screwdriver
setscrews
fluted-type of key
studs
thread-forming screws
self-tapping screws
thread-cutting screws
nuts
regular and heavy
washerlike face
jam nuts
machine-screw nuts
slotted nuts
castle nuts
cotter pin
self-locking nuts
cap or acorn nut
wing nut
plain washer
lock washer
spring lock
tooth lock
tooth lock washers
rivets
cotter pin
taper pins
taper-pin reamer
cone head

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

BENCHWORK

dowel pins
offset screwdriver
pliers
slip-joint pliers
combination pliers
side-cutting pliers
needle-nose or long-nose pliers
diagonal pliers
open-end wrenches
box wrenches
combination box and open-end wrench
adjustable wrench
monkey wrench
pipe wrench
T socket or L socket
extension bar
swivel-joint connector
spanner wrench
hook-spanner wrench
pin-spanner wrench
socket-head screws
torque wrench
force is
metric wrenches
soft-faced hammer
tang
prybar
recessed-head screw
dry insulated flooring

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

BENCHWORK

is referred to
offset
alternately
coarser the tooth
distribute
maintaining
oval or circular pieces
light strokes
release
uniform speed
tension
diagonally
to not miss hitting
marring
frequently
ground
ragged
efficiently
skilled craftsman
critical fitting
process
classification
coarseness
heel
clog
rasp
conventional
exacting
primarily
average
eliminates
sharp tang
puncture
is preferred
moisture
snap
apart
pressure
equalized
rap
curled
moderate
constantly
exposing
scratching
friction
device

slender
solvent
decorating
attractive
appearance
wear away
grain of abrasive
absolute necessity
mass production
are segregated
durable
rugged toughness
polishing grains
stones and sticks
individually
lengthwise
drawfiled
mounted on
motor with
wedged
clog
be equipped with
irregularly
industrial
diamond
symmetrical
frequent intervals
secure
satisfactory point
due to
chamfered threads
periodically
designed
specific purposes
distortion
thread outline
cylindrical blank
vanished
Renaissance
renewed
artisans
a suit of armor
plume
crude foot-operated lathe spindle
thread combing tool
traversed
manufactured
industrial revolution

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

BENCHWORK

terminology
uniform
adjacent
intentional difference
correlated dimensions
previously
60 degrees (°)
external thread
worn tool
be thought of
technical
distinguished
specified
overlapping
standard series
available
occasionally
in cooperation with
established
researched
made up of
in process
flexibility
indicating thread gage
eccentricity
originally
improperly
twisting
bottoming taps
expanded
correct procedure
back off
good judgement
eventually
alternately
inserting
specific details
latest edition
no matter how
removal
extremely
a little undersize
odd-sized holes
chatter
overloading
distribute
conduit
undersize first
average shop
vibration
ruins
delicate cutting-edges
undesirable
hexagon
slotted
decorative touch
marring
facilitate
resist
impulse
leverage
corroded part
extra careful
ease up
inefficient
brace

V. Bandsawing

A. Text assignments
Unit 31, pgs 187 to 193 - Band Machining Equipment
Unit 32, pgs 194 to 199 - Band Machining

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 17

Teaching Materials Source Machine Tool Metalworking
Chapter Bandsawing, pages 187 through 199
Lab Manual pages
Additional Instructor Materials

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
The student will learn how to operate the vertical and horizontal bandsaw.	see Glossary	see Glossary 4.7 4.8	

Materials and Notes

Length of Lesson	Evaluation
one day	Written test and classroom observation.

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

BANDSAWING

band machining
horizontal band saw
vertical band saw
band speed indicator
band tension indicator
flash grinder
blade shear
welder
operating control panel
gearshift lever
variable speed control
foot control for table
coolant and chip drawer
hydraulic oil reservoir
table tilt lock handwheel
servo-contour feed handwheel
coolant/air applied through
precision saw guides
worklamps
job selector
narrow-tooth kerf
throat capacity
three-wheel arrangement
tracking
variable-speed drive
transmission system
trunnions
saw or blade guides
contour feed
carbon steel blades
high-speed steel blades
alloy-steel blades
wear resistant
carbide-tipped blades
uranium
titanium
beryllium
tooth shapes
skip-tooth blade
hook- or sabre-tooth
regular or raker
hewing to the line
grooved thrust roller
tension adjustment
annealing
alignment pin
table slot
dial indicator
tensioning mechanism
contour sawing
rhythmic click
blade speed
metallic
straight sawing
miter gage
ripping
contour cutting
dimensional cuts
angle cuts
internal cuts
precision slotting
splitting round or flat stock
friction cutting
raker set blade
band filing

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

BANDSAWING

reserved
illustrated
as a result
freehand
whereas
exclusively
absorbs
tachometer
regulated rate
general adaptability
governing
undue strain
tension
formula
vibration
welder's jaw
conform
matter of experience
built-up edge
is free of
imperfections
attempt to
factor
create friction
efficient
excessive feed pressure
premature wear
guidepost
correct stance
accessories
manually
hydraulically
manufacturer's directions
economical
cross-sectional area
normally
scoop out
immediately
advantages
installing
tracking

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

DRILLING MACHINES

maximum
column
upright
average
compounds
emulsions
margin
general purpose
comparatively
penetration
characteristics
imbedded
conventional
tipped with
sufficiently
adequate
overhang
precautions
chatterfree operation
traits
workmanship
naturally
overhang
maintained
enlarge
wobbles
securely
whirling around
elongated
intersecting lines
device
duplicate
convenient
conventional reamers
separate compartment
regardless of
versatility
varied
enclosed by
suitable mechanisms
in addition to
utilizes
manually
numerically
programmed
adaptation
resembles
steel drill
lips identical
lip clearance
sudden
cracks
is credited with
inventor
career
improvement
pistols
ordered
the U.S. government

VII. Drilling Machines

A. Text Assignments

1). Unit 34 pages 200 through 211
Types of Drilling Machines

2). Unit 35 pages 211 through 223
Twist Drills

3). Unit 36 pages 223 through 228
Drilling Holes in Flat Workpieces

4). Unit 37 pages 228 through 230
Drilling Holes in Workpieces

5). Unit 38 pages 231 through 234
Reaming on a Drillpress

6). Unit 39 pages 235 through 238
Using other Cutter in a Drillpress

7). Unit 40 pages 239 through 245
Drilling machines in Industry

B. Student Project #1
Drill Grinding Gage

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # 18

Teaching Materials Source Machine Tool Metalworking
Chapter Drilling Machines pages 200 through 246
Lab Manual pages
Additional Instructor Materials Working Drawing for Drill Grinding Gageand Drill Sharpening

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Students will learn to operate a drill press, make a drill grinding gage and sharpen a twist drill. Students will learn to identify and use the four different classifications of twist drills.		6.4 7.1	Students are to layout and machine a drill grinding gage and sharpen a drill grinding gage

Materials and Notes

Length of Lesson	Evaluation
4 days	Written, observation of student activities and finished products produced.

GENERAL MACHINIST
TECHNICAL VOCABULARY

DRILLING MACHINES

countersinking
counterboring
tapping
drill chuck
medium-sized floor-type drill
straight-shank cutting tools
depth gage and stop
quill
to tilt the table
chuck key
feet per minute (fpm)
surface feetper minute (sfpm)
circumferential speed
revolutions per minute (rpm)
feed
coolants
a drill vise
an angle vise
aluminum and alloys
magnesium and alloys
monel metal
mild steels
tough alloy steels
steel forgings
cast steel
wrought iron
high tensile steels
manganese steel
cast iron
malleble iron
stainless steel
titanium alloys
tool steel
decreasing effectiveness
kerosene
kerosene and lard oil
soluble oil
mineral oil
sulfurized oil
increasing expense
universal machine vise
angular adjustments
safety work-holder
universal compound vise
V blocks
strap clamps and T bolts
straight strap clamps
bent-tail or gooseneck clamps
U-strap clamps
finger clamps
angle plate
drill jig
drill bushings
parallels or parallel bars
jack screw
tube coupling
spacer tube
ball screw
swivel base
jack base
step blocks
shims
twist drills
swivel blocks
reduced shank
carbon-steel drills
the web
the margin
cutting lips
dead center
surface of the point
the lip relief
two-flute drill
cylindrical cavity
heavy-duty
fast spiral
drilling stainless steels
slow spiral
super cobalt
silicon chrome
chrome-nickel alloy steels
armor plate
acid-resisting castings
carbide-tipped
subland drill
core drill
coolant feeding drills
optional plug
masonry drills
special ultrahard metal
portable rotary electric drill
silicon-carbide wheel
outer corners break down
cutting lip chip
hole rough
chatterfree operation

GENERAL MACHINIST

TECHNICAL VOCABULARY

DRILLING MACHINES

bakelite
laminated plastic
snug
negatvie angle
opposite lip
drill pivots
thin the web
tailstock center
precision regrinding attachments
straight-shank twist drills
prick punch mark
roundnose chisel
squeaking
groaning
a taper sleeve
drift
drill socket
pilot hole
drill drift
proof circle
concentric
blind hole
depth scale
drill jig
drill bushings
thumbscrew
setscrew
reamers
carbide-tipped cutting-edges
jobber's reamers
shell reamers
positive radial rake
carbide-tipped reamers
fluted chucking reamers
rose chucking reamers
expansion chucking reamers
step reamers
morse taper reamers
cooling properties
rust preventative compound
bellmouth
rigidity
versatile machine tool
countersinking
recess
flathead
counterboring
square shoulder
fillister-head screws
shoulder pins
axial rake
helix angle
peripehral land
peripheral relief
spot facing
tapping attachment
combination cutting
drilling machines
sensitive drill
spindle drilling machine
standard upright drilling machine
gang drilling machine
multiple drill head machine
semiautomatic drilling machine
radial drilling machine
turret drilling machine
tapping machine
high production work
pneumatic or hydraulic operated drilling vise
precision rotary
heavy-duty drill fixture
jig borer
jig grinder
steel drill
lips identical
lip clearance
web thickness
engine lathe

VI. Engine Lathe

1. Text Assignments

pages 247 through 375

a. Unit 42 The Engine lathe

b. Unit 43 Getting Acquanted with the lathe

c. Unit 44 Care of Lathes and Personal Safety

d. Unit 45 Cutting Toos and Tool Holders

e. Unit 46 Feed, Speed and Depth of Cut

f. Unit 47 Locating and Drilling Center Holes

g. Unit 48 Facing Ends with Workpiece Held Between Centers

h. Unit 49 Rough Turning Between Centers

i. Unit 50 Finish Turning Between Centers

j. Unit 51 Turing Work to Two Diameters

k. Unit 52 Installing a Chuck and Mounting the Workpiece

l. Unit 53 Facing, Turning and Cutting off a Workpiece Mounted in a Chuck

m. Unit 54 Drilling

n. Unit 55 Boring

o. Unit 56 Reaming

p. Unit 57 Turning With the Workpiece on a Mandrel

q. Unit 58 Mounting a Workpiece in a Lathe Chuck or on a Faceplate

r. Unit 59 Knurling

s. Unit 60 Filing and Polishing

t. Unit 61 Taper Turning with Tailstock Set over

u. Unit 62 Taper Turning with a Taper Attachment

v. Unit 63 Taper Turning and Cutting Angles with the Compound Rest

w. Unit 64 Turning and Boring with a Steady or Follow Rest

x. Unit 65 Cutting External Threads

y. Unit 66 Cutting Internal Threads

z. Unit 67 Turret (Indexing) Lathes

z.a Unit 68 Lathes in Industry

GENERAL MACHINIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # VII

Teaching Materials Source Engine Lathe
Chapter _____, pages _____
Lab Manual pages _____
Additional Instructor Materials _____

Main concepts student will learn:

The students will learn these basic funtions of the metal lathe and attachments.

1. parts of and attachments to the metal lathe
2. care of lates and personal safety
3. cutting tools and holders
4 speeds and feeds
5. drilling and boring and reaming holes
6. turning in chuck and between centers
7. knurling
8. filing and polishing
9. taper turning
10. cutting internal and external threads

Technical Vocabulary

see Glossary

Related General Vocabulary

see Glossary

1.9
1.15
4.8

Teaching Activity

Student will be assigned a series of lab activities to be completed.

Materials and Notes

Length of Lesson

10 weeks

Evaluation

Written test and observation (classroom) of Lab activities.

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

ENGINE LATHE

engine lathe
power-driven machine
original slide rest
brain wheel
cams
live center point
carriage cross-feed slide
bed
flame-hardened ways
integral part
pinion gear
step pulley
back gear lever
feed reverse lever
pulley guard
lockpin guard
bull gear lockpin
spindle bearing cap
drive plate
live center
spindle
taper sleeve
threaded spindle nose
cam lock spindle
long
taper key drive spindle nose
flat belt drive
headstock
tailstock
V-belt drive
variable-speed drive
geared head
carriage
toolpost
cross feed handwheel
clutch kickout
carriage handwheel
power feed lever
halfnut lever
clutch lever
threading dial
lock screw
tool-post slide handwheel
dog
monkey wrench
dead center
tailstock center
revolving dead center
live dead center
saddle
apron
longitudinally
rack
splitnut
cross slide
transversely
compound rest
micrometer collars
tool post
ring collar
rocket
quick-change gearbox
lead screw and feed rod
neutral position
half-nut (splitnut)
halfnut lever
reducing sleeve
bent-tail standard-type
bent-tail safety-type
clamp-type lathe dog
post grinder
precision bed turret
duplicating attachment
milling attachment
mica undercutter
reconditioning armatures
concave
convex facing
apron handwheel (longitudinal feed)
cross-feed handle
compound-rest
gibs
taper gibs
tailstock-clamp nut
bed-clamp lever
binding or ram lock lever
tailstock handwheel
remember
control dial
power off

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

ENGINE LATHE

automatic feed know
gib adjustment
disengaged
feed-change or selector lever
automatic feed knob
feed-reverse lever
feed-change lever
witness
tailstock casting
lathework
distracted
water-hardening steels
high-speed steels
hard-cast nonferrous alloys
sintered (cemented) carbides
ceramics
high-carbon tool steels
chromium
vanadium
tungsten
M steels
molybdenum base
T steels
stellite
Rex alloy
tantung
sintered carbide tools
circular
faceted cutting edges
throwaway carbide tips
high-speed steel cutter bits
toolholder angle
open-side or heavy-duty tool block
turret tool block
swiveling block
quick-change-type tool system
cutting-edge
nose
flank
point
side relief angle
eight-station turret toolholder
end relief angle
end cutting-edge angle
side cutting-edge angle
nose radius
rake angles
back rake
zero back rack
negative rake
side rake
single-point tools
right cut
left cut
right-hand and left-hand tool bits
right-cut single-point
left-cut tool bit
roughing tool
finishing tool
roundnose cutting tool
square-nose tool
cutoff or parting tool
side-facing tools
side tools
separate chip breaker
longitudinal force
radial force
tangential force
ductile material
coarse-grit aluminum-oxide
fine-grit wheel
side-and back-rake angles
bar stock
surface speed in feet per minute (sfpm)
machined surface
hermaphrodite caliper
surface-height gage
bell-type center punch
prickpunch
combination drill and countersink
drill and center reamer
bell-type combination center drill
facing
right-cut facing tool
offset toolholder
half center
tool-post screw
tool post
toolholder
rocker base

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

ENGINE LATHE

ring collar
compound rest
T slot
toolholder & tool clamped "short"
cutting tool on center line
lathe dog
right-cut roughing tool
straight toolholder
T slot of the compound
right-cut finishing tool
backlash
filleted shoulder
concave surface
undercut shoulder
undercutting
necking
three-jaw universal chuck
gripping
recessing
four-jaw independent chuck
brackets
forgings
combination chuck
headstock chuck
center-rest chuck
bronze jaws
graphite
taper key-drive spindle nose
cam-lock drive spindle nose
knock-out bar
firm seating
a spanner wrench
handwheel
identical workpieces
adjoining jaws
irregular shaped workpieces
brass spring clips
projection (nub)
step facing
rigid-pattern and spring-(gooseneck) pattern
spring cutting-off tool
Williams' rigid cutting-off tool
hogging
drilling
boring
reaming
tailstock pad
crotch
combination center drill
countersink
drill holder
pilot hole
inner end
resistance
straightening
machine-reamed
toolholder and bar with interchangeable ends
clamp-type with plain or sleeve bar
three-bar boring tool
end relief
side-relief angle
side-cutting angle
boring bar
compound rest
feed helps
bell-shaped hole
counterboring
standard work-holding fixture
tapered shank
straight-shank reamer
mandrel
gear blanks
candlestick holders
arbors
solid mandrel
expansion mandrel
gang or nut mandrel
chucked or threaded mandrel
arbor press
soft-faced lead
brass hammer
dead center
draw-in collet chuck
hexagon-shaped workpieces
spindle-nose cap
collet sleeve

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

ENGINE LATHE

draw bar
multisize collets and chucks
spring arrangement
flexible rubber collet chuck
molded rubber
releasing and gripping action
maximum tool clearance
draw-in collet chuck attachment
drive or dog plate
T-slot faceplate
slotted faceplate
knurling
diamond-shaped
straight-line pattern
embossing
extruding
single self-centering head
medium feed
top and bottom rolls
equidistant
impression
cross pressure
brushing
automatic power feed
filing and polishing
mill file
single-cut file
lathe file
clogging
pinning
right-handed method
left-handed method
out of round
aluminum oxide abrasive cloth
silicon carbide cloth
superfine finish
taper turning
tailstock set over
setover method
live center
bearing surfaces
bell-type center drill
taper per inch (tpi)
tpf=taper per foot
cross-feed micrometer collar
paper feeler
mating part
taper ring gage
taper attachment
offsetting the tailstock
plain taper attachment
saddle
telescope taper attachment
plain taper attachment
using a taper-test gage
gage blocks
drill rod
a sine bar
right angle
obtuse angle
complementary angles
supplementary angles
draftsmen
follower rest
steady rest
bronze-tipped jaws
undercut
gearbox
splitnut
halfnut
feed-change lever
thread chasing dial
slender shafts
thread-ring gages
thread micrometer caliper
cutting internal threads
forged boring tool
standard tool bit
center gage
steady rest
tap-drill size
multitool turret
additional exterior cutting tools
interior cutting
interior chamfer tool
ram type
bar or chucking lathe
ram-type turret lathe
automatic controls
saddle-type turret lathe

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

ENGINE LATHE

flanged toolholders
multiple-spindle automatic screw
eight-spindle automatic screw
  machine
vertical turret lathe

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

ENGINE LATHE

groundwork
perfected
initiated
platform
sturdier
prompted
disadvantage
reverse position
offset
jammed
inserted
versatile
excessive wear
compensate
steady,even movement
roughened and dented
recommended
convenient
medium speed
evaluation
characteristics
classification
adequate
designated
achieved
is comprised of
extensively
mentioned above
consists of
excellent
tends to
negative rake
ease up on
formula
principal methods
average shop
several methods
comparatively
snugly
install
release
reference line
revolve
true up
get wound

disburbing
shrinks
proficient
discouraged
imperfect results
referred to
device
affected
individual
onto it
later on
as follows
corresponding
identical workpieces
irregular-shaped
eccentrically
result in
hogging
steadily
uniformly
temptation
extremely dangerous
in comon use
varying from
in place of
substituting
normal turning operations
are
confused with
a gang or nut mandrel
a chucked or threaded mandrel
arbor press
recess
unavailable
a process of
abruptly force
accomplished
mirrorlike finish
manufacturers
decorative objects
subtracting
disadvantages
associated with
additional support
is dependent upon

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

ENGINE LATHE

satisfactorily
regardless of length
exact size
vertex
minutes
seconds
a right angle
obtuse angle is
complementary angles
supplementary angles
perpendicular
cellophane paper
marring
insufficent
index plate
numbered line
odd-numbered line
alternately
acme
adaptations
additional exterior cutting
a wide variety of
in addition
general-purpose machines
specialized operations
simultaneously
machining centers

VII. Milling Machine

1. Text Assignment
   pages 403 through 487

   Unit 79 The Milling Machine and Its Parts

   Unit 80 Milling Cutters and Cutter Holders

   Unit 81 Cutting Speeds, Feeds and Coolents

   Unit 82 Work Holding Devices and Their Uses

   Unit 83 Milling a Flat Surface (Plain or Slab Milling)

   Unit 84 Face Milling

   Unit 85 Side Milling, Straddle Milling

   Unit 86 Sawing, Slotting, and Other Milling Operations

   Unit 87 Cutting a Spur Gear

   Unit 88 The Verticle Milling Machine

   Unit 89 Using a Vertical Milling Machine

   Unit 90 Milling Machines in Industry

GENERAL M/ INIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # VIII

Teaching Materials Source Milling Machine
Chapter _____, pages _____
Lab Manual pages _____
Additional Instructor Materials _____

Main concepts student will learn:

The students will learn these basic functions on the horizontal and vertical milling machines.

1. parts of
2. safety
3. cutters and cutter holders
4. cutting speeds, feed and coolant
5. work holding devices
6. milling flat surfaces and face milling
7. cutting a spur gear

Technical Vocabulary

see Glossary

Related General Vocabulary

see Glossary

6.1
6.4
7.1

Teaching Activity

Student will be assigned a series of of lab. activities to be completed.

Materials and Notes

Length of Lesson

4 weeks

Evaluation

Written test and classroom observation of Lab activities

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

MILLING MACHINE

milling machine
multiedged
column-and-knee type
peripehral milling
slab milling
drum switch
speed chart
lever for back gear engagement shaft
longitudinal feed handwheel
motor plate clamping lever
belt tension spring
knee
cabinet base
lamp attachment
overarm
arbor support bracket
arbor
table
power table feed
saddle
cross feed handwheel
table raising crank
raising screw
overarm bracket
overarm brace
transverse travel ball crank
reverse feed gear box
knee life screw
motor control lever
variable speed control
rapid table travel crank
table feed gear box
the amount of table travel
horsepower
plain
universal
vertical
reciprocal milling
straddle milling
keyseats
gang milling
hollow shaft
bearnings
set-in lugs
inner support
outer support
universal machines
vertical milling machine
adjusting table feed
raising or lowering the knee
cross-feed
traverse handwheel
reversing the direction of spindle rotation
burnishing action
brazed tipped blades
inserted blade cutters
helical plain milling cutters
straddle milling
slotting
metal-slitting saws
plain metal-slitting saws
staggered-tooth metal-slitting saws
metal-slitting saws
shell end mills
angular milling cutters
T-slot milling cutters
Woodruff keyseat milling cutters
dovetail milling cutters
form-relieved cutters
gear-milling cutters
face-milling cutters
arbor-type milling cutters
shank-type cutters
construction of the cutter
hand
hand of cut
hand of helix
spacing collars
bearing sleeve
draw-in bolt or bar
adaptors
sleeve
collet
arbor-type cutters
shank-type tools
face-milling cutters
rap
draw-in bolt
predetermined wear land
machinability
manual feed

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

MILLING MACHINE

inches per revolution of the spindle or cutter
feed arrangement
cone-driven machines
inches per minute (ipm)
peripheral speed
surface speed
specific job conditions
frail workpieces
hand-feed operations
maximum production rates
minimum tool wear
maximum cutter life
$rpm = \frac{4 \times sfpm}{d}$
sfpm = surface feet per minute
d = diameter of cutter in inches
F = f x T x N
rigid set-ups
easy-to-machine work
rugged cutters
slab milling cuts
high tensile strength materials
coarse-toothed cutters
feed rate
rated horsepower
maximum metal removal
cubic inches per minute
plain vise
swivel vise
soluble oil
cooling qualities
intermittent cooling
adjustable or angle vise
complex universal-angle vise
rack vise
universal chuck
single pinion
scroll
rotary table
cross-slide table
lateral feed
dividing head
headstock (index head)
footstock (tailstock)
notches
milling fixture
babbitt hammer
slot strap clamp
case hardened hex nut
finished flat washer
block or shims
T-slot bolt
T-slot base
workpiece with irregular base
spacing collars
bearing collar
overarm
arbor or overarm support
conventional milling
contact point
insufficient lubricant
power table feed
face milling
square-head bolt
staggered-tooth side-milling cutter
interlocking cutters
sawing
slotting
slitting saw
impellar blade
large diameter saws
large-diameter collars
keyslot
woodruff key
keyslot cutter
gang milling
standard Jacobs chuck
spur gearing
involute (single curve)
cycloidal (double curve)
curve af
a distance ab.
end milling
hobbing
formed milling cutter
circle stationary
diametral pitch
circular pitch
pitch diameter
outside diameter
addendum

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

MILLING MACHINE

dedendum
working depth
whole depth
reciprocating motion
parallel shafts
circular pitch
chordal thickness
chordal addendum
arc thickness
rise of arc
gear blank
bronze sectors
left sector arm
right sector arm
vertical milling machine
fly cutting
profiling
reaming
slotting
three-dimensional duplicating
tracing
V-belt drive
graduated swivel base
switch forward and reverse
column
table hand-feed handle
graduated dial
knee clamps
base
draw bolt
swivel toolhead
depth scale and stop
vertical feed handwheel
table stops
table clamp screw
cross-feed handle
cross feed graduated dial
knee
crank for elevating knee
column
knee and saddle
ram and turret arrangement
spindle head assembly
lubrication requirements
quill locking lever
power down feed
measuring attachment
vertical shaping head
agreed on
carbide-tipped or solid-carbide end mills
surface finish
draw-in bar
#9 B&S taper spindle
#9 B&S endmill taper shank
#9 B&S taper spindle
straight shank end mill
R-8 Bridgeport taper spindle
#5 B&S taper end mill
#50 American standard steep taper spindle
straight shank end mill
stub arbor
elongated slot
open-end groove
a boss
metalworking plants
tracer-profiler
profiler-duplicator
command section
tracer head
stylus
command signals
hydraulic motors
command information
die-sinking machine
hydraulic duplicating machine
optical scanner
circuitry
bed-type machine
planer-type milling machine
horizontal boring machine
jig borers
machining centers
automatic tool-control systems

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

MILLING MACHINE

periphery
experimental laboratories
structure
protrude
detailed information
precautions
toothmarks
concave
convex
corner-rounding cutters
concentric
reasonably uniform
priamrily
rapid removal
advances
as a general rule
as coarse as possible
takes into consideration
factor
dissipates
copious supply
preserve
accuracy of motion
govern
is geared to
accomodate
conventional
distorted
a thin shim of brass
slightly
a pair of
securely
slippage
for purposes of
traced by
taut
progressively
generates
reciprocating
manipulate
power
versatile
efficient
industrywide standards
instead
column
manufacturer's recommendations
simultaneous contact
is capable of
uneconomical
reinforced area
special functions
in the same manner as
considerable travel
classified as
in many respects
complicated
utilized

IX. Grinders and Abrasive Machining

1. Text Assignments
   pages 489 through 516

   Unit 92 Abrasive Machining and Grinding

   Unit 93 Grinding Wheels

   Unit 94 Surface Grinder

   Unit 95 Cylindrical Grinding

GENERAL M/ ANIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # IX

Teaching Materials Source Grinders and Abrasive Machining
Chapter _____, pages _____
Lab Manual pages _____
Additional Instructor Materials _____

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Student will learn the basic concepts of grinding and tool sharpening.	see Glossary	see Glossary ---- 8.1 4.7	Student will complete assignments in tool sharpening.

Materials and Notes

Length of Lesson	Evaluation
2 weeks	Written test and evaluation of classroom assignments.

GLOSSARY

GENERAL MACHINIST

TECHNICAL VOCABULARY

GRINDERS AND ABRASIVE MACHINING

offhand grinding
precision grinding
snag castings
grind wells
cylindrical grinding
plunge-cut grinding
form grinding
internal grinding
surface grinding
centerless grinding
plain center-type cylindrical grinder
horizontal spindle reciprocating table machine
horizontal spindle rotary table machine
vertical spindle reciprocating table machine
vertical spindle rotating table machine
tool and cutter grinding machine
multitoothed cutting
silicon carbide and aluminum
low tensile
silicate
rubber
resinoid
shellac
oxychloride
bond
adhesives
kiln
molten glass
grade
structure
portable grinding tool
flexible shaft
nonmetallic materials
severity of the grinding operation
intermediate abrasive
average severity
bumping
impact
elevating handwheel
cross-fed handwheel
grain
vitrified
table handwheel
lever
high reciprocation machines
infeed
distortion
nozzle
contact area
permanent magnet
electromagnet-type chuck
energized
direct current
inner flange
outer flange
excessive strain
elevating
rate of traverse
sparking out

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

GRINDERS AND ABRASIVE MACHINING

fragile tools
fly apart
sequence
prefix
porous
acid
denote
distributed
not excessive
engages
satisfactory operation
balanced
defective
evenly
accurate finish
warpage

X. Computer Numerical Control

1. Text Assignments

Unit 1 pgs 1 through 6 - Introduction

Unit 2 pgs 7 through 8 - Machine Systems

Unit 3 pg. 9 - Understanding ene machining

Unit 4 pgs 9 through 13-Machine Movements

- a. Point Identification
- b. Absolute Values
- c. Understanding a set of Points
- d. Relative Values
- e. Program Reference Zero
- f. Absolute Values compared to Relative Values

Unit 5 pgs 14 through 18-ene Lathe - two axis system

- a. Auxilary Rotary Axis

Unit 6 pgs 19 through 21-Machine Movement: Point to Point and Continuous Path

Unit 7 pgs 22 through27-Machine Movements: Computer Assisted

Unit 8 -Programing

Unit 9 pgs 3-1 thru 3-66: First Level Programing

- a. Check list before Turn-on
- b. Programming Formats in ene
  - 1) Coded Imputs
  - 2) Conversational Imputs Systems
  - 3) Comparison Between Codes
- f. Three Reference positions
  - 1) Program Reference Zero
  - 2) Local Zeros
  - 3) Zero Coordinates
  - 4) Zer A+
- g. Machining on Angle
  - 1) Linear Interpolation
- h. Polar Coordinates
  - 1) Absolute Angles
  - 2) Relative Angles
  - 3) Programming Curves

X. Computer Numerical Control (continued)

4) Machining Curves on Cartision Controllers

5) Fixed Cycle

6) Point Identification

7) Programming Circles and Arcs Using Polar Coordinates

8) Programming Angles

i . Polar Rules

1) General Rules

2) Straight Line Rules

3) Circular Rules

Unit 10 - Safety

a. Computer Machining Safety

b. Programming Safety

c. Planning a Safe, Efficient Cutter Path and Sequence of Cuts

Unit 11 Level 2 Programming

a. Programming to Compensate for the Cutter Radius

b. Cutter path Programming

c. Automatic Tool Radius Compensation

1) Types of Compensators

d. Set up work in ene

GENERAL M INIST CURRICULUM
VOCATIONAL TRAINING LESSON PLAN # X

Teaching Materials Source _____
Chapter _____, pages _____
Lab Manual pages _____
Additional Instructor Materials _____

Main concepts student will learn:	Technical Vocabulary	Related General Vocabulary	Teaching Activity
Students will learn the basic concepts of computer controlled machining.	see Glossary	see Glossary --- 3.5 3.8	Students will have assignments to complete with hands on use of CNC Vertical Milling Machine

Materials and Notes

Length of Lesson	Evaluation
6 weeks	Written test and observation of lab assignments

GENERAL MACHINIST
TECHNICAL VOCABULARY

COMPUTER NUMERCIAL CONTROL

absolute, relative or polar
floating position
local reference
machine home
open loop machines
synchronization
previous point activities
limit switches
local zeros
coods
refcoods
XY--REF 0
entries
linear interpolation
relative prefix
previous block
angular line A-B
challenge
values
retrace
floating zero points
polar coordinates
absolute and relative angles
programming radii
circular parameters
machining curves on cartesian controllers
fixed cycle
point identification
center point
complete point
start point
radius length
absolute radius callout
aluminum plate
fluted cutter
polar geometry
mix values
EIA coded word
coded input system
G81 cause
M13 cause
4 operation modes
XY->REF 0 ?
the general tool path
the sequence of cuts
a hard copy of the program
mylar punched tape
stored data
Triway Mfg. N/C Document
efficient cutter path
whole operation
graphics
graphic representation
graphics unit
rapid traverse moves
machine capacity
part shape
inside pocket
undersize cutter
maximum
dedicated slide rule
dry run cycle
readout
holding device
tool offsets
vibration
loose tooth
crash
emergency procedure
wrenches
louvers
quill up/down control lever
X axis motor
Y axis motor
crash procedure
.25 endmill
cutter path adjustments
Machinery's Handbook
internal features
compensated dimension
twice the radius smaller

GLOSSARY

GENERAL MACHINIST
TECHNICAL VOCABULARY

COMPUTER NUMERICAL CONTROL

CNC work
rotational notation
numerical control
computer numerical control system
axis
programmer
cartesian
absolute values
base position
program reference zero
in sequence
relative system
incremental system
the quadrants
accumulative error
Datum A
auxiliary rotary axes
automatic vise
horizontal mill axes
rotary table axis
continuous path
micro-processor
punched tape
reader
cranking
pre-determined tolerance
parameters (requirements) of the curve
major system components
manual operation
data storage
retrieval
graphic display
progress quiz
relative point identification
relative tool movement
START INS 100
TD = .25
FR XYZ = 10.
SETUP - zcxyu
GO X 1.937
GO Y 1.00
GRf Z-2.00
GR Y-.50
GR Z-.10
ZERO AT
Y .5
ZERO X
input formats
cartesian
coordinates
excessive friction
uppermost position
head elevator post
power receptacle
machine initialization
power up cycle
backlash
coded
conversational
conversational software
prompted
user friendly
feedrate commands
EIA Recommended Standards
point-to-point positioning
interpolation
circular interpolation
acceleration code
smooth rate
cutter compensation
spotdrill
end of program code
Dyna Prompt
customizing
offline system
CADD
Computer Aided Drafting & Design
Computer Aided Manufacturing (CAM)
operation modes
start section
preparatory information
body
end section
end newpart
end new ref
feed rates
SetUp location block
feed rate
prompted input programming
miscellaneous commands
PRZ
Photo courtesy
absolute values

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

COMPUTER NUMERICAL CONTROL

objectives
foundation
interpret
compiles
is related to
remains
stationary
negative
positive
learned
absolute
relative
a grid of
illustration
figure
previous page
farthest
convenient
consistency
sketch
indicated
usefulness
advantages
disadvantages
identifications
complicated
especially
technique
adjusting
photo courtesy
according to
dedicated
callouts
results in
simultaneously
approximation
smoother
with respect to
examination
take into consideration
be aware of
back leaf
appendix
computer applications
unassigned
special routines
reference chart
specific codes
file number
sequence
relocate
absolute
accumulated error
coordination
verified
are referenced to
generate
solution
flexibility
drawing compass
variations
trigonometry
geometry
designated person
elsewhere
be accomplished with
per the sketch
details
categories
interrelated
a series of
documentation
disaster
misunderstandings
trend
results
dedicated slide rule
tendency
ignore
executed
setup document
relax
precautions
machine features
applications
limitations
recommended operating procedures
gaseous
explosive locations
removing material

GLOSSARY

GENERAL MACHINIST

RELATED GENERAL VOCABULARY

COMPUTER NUMERICAL CONTROL

creates
self progress quiz
compensate for
reduced version
is comprised of
bisector
symmetrical